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SYLLABUS

OF

Doctor HIGGINS's

COURSE

OF

Philoſophical, Pharmaceutical,

AND

TECHNICAL

CHEMISTRY.

SECTION I.

INTRODUCTORY LECTURES.

DEFINITIONS of combination, decompoſition, and analyſis, illuſtrated by experiments.

Definition of modern chemiſtry.

Obſervations on phyſical arguments and reaſoning by induction; on the diſtinctions of concluſive and inconcluſive induction; on the futility of phyſical diſputes; and on the vain pretenſions of mere experimenters and of mere theoriſts.

The author's plan of teaching chemiſtry, with obſervations on the advantages of it, and on the proper uſe of his theories.

Advertiſement of ſuch deviations as may be made in the preſent courſe, from the plan of this Syllabus, or from the terms of former propoſals.

The author's ſenſe of the words element, atom, molecule, and particle; with curſory obſervations on theſe ſubjects, illuſtrated by experiments.

The author's ſenſe of the word attraction; with obſervations on attraction; and on the circumſtances in which the uſual diſtinctions of attraction, into elective attraction or affinity, compound elective attraction, attraction of intermediums, attraction of aggregation, coheſion, capillary attraction, magnetic attraction, polarity, gravitation, electrical attraction, &c. are admiſſible.

EXPERIMENTAL ILLUSTRATIONS.

The author's ſenſe of the word repulſion; with obſervations on repulſion, illuſtrated by experiments.

The author's ſenſe of the words property of matter, power, law of nature; with obſervations on properties of matter and laws of nature, illuſtrated by experiments.

Obſervations on operative or practical chemiſtry, and the impoſſibility of obſerving ſtrict order in teaching it: and the author's reaſons for preſenting the following ſketch of the chief objects of philoſophical and technical chemiſtry, introductory to the practical courſe.

The author's diſtinction of the elements, with obſervations on the grounds and uſes of theſe diſtinctions, illuſtrated by the proper objects and by experiments.

Diſtinguiſhing characters of earthy matter; and ſpecimens and chemical arrangement of earthy bodies, with obſervations and experimental illuſtrations.

Diſtinguiſhing characters of water, with general obſervations and experimental illuſtrations.

Diſtinguiſhing characters of air. Obſervations on the attractive and repulſive properties of air; on divers bodies which hold it combined; on bodies which abſorb and hold it in great quantity, by capillary attraction; and on the aerial atmoſphere; with illuſtrative experiments.

Diſtinguiſhing characters of acid matter, with obſervations on its attractive and repulſive properties, illuſtrated by experiments. Specimens of acid and acidulous elaſtic fluids, and of the chemical acids, with obſervations on theſe.

Diſtinguiſhing characters of alkaline matter, with obſervations on its attractive and repulſive properties; illuſtrated by experiments. Specimens of the alkaline elaſtic fluid, and the chemical alkalies, with obſervations.

Specimens, arrangement, and diſtinguiſhing characters of the ſaline bodies.

Definitions of ignition and combuſtion, with experimental diſtinctions and illuſtrations.

Experiments ſhewing the changes produced in bodies by the introduction or privation of the kind of matter called phlogiſton; and ſhewing the tranſlation of this matter from one body to another, in divers ſeries of bodies.

Experiments ſhewing the diſtinguiſhing characters of phlogiſton, and eſpecially its attractive and repulſive properties. Specimens and arrangement of the phlogiſtic elaſtic fluids, and of thoſe bodies which contain phlogiſton in conſiderable quantity; with obſervations on the ſeveral claſſes and orders of them.

Experiments and obſervations, ſhewing that phlogiſton, whether combined or detached, is a kind of matter different from that of Light, as much as it differs from air or acid.

Sketches of the author's notions of the matter called Light, and of illumination, darkneſs, colours and ſome other ſubjects of optics.

Sketches of the author's notions of concentrated Light, or that condition of Light wherein it acts as Fire, and is Fire: of his notions of concentrated combined Light, or of that condition of Light, wherein it forms a part of the ſubſtance of bodies without heating them:

Of his notions of the detachment of Light from theſe bodies in divers proceſſes; and of the Fire which ſubſiſts in theſe bodies and the neighbouring ſpaces, during the expanſion of this concentrated Light, from them: of his notions of the matter and the powers by which Light is concentrated and combined in bodies; and of the other powers by which theſe are counter-acted and Light is detached from its combinations, in divers proceſſes, and eſpecially in combuſtions and detonations:

Of his notions of the agency and tranſlations of phlogiſton in theſe caſes:

Of his notions concerning heat and cold, of the phænomena of illumination without heat, and bodies ignited or heated without being luminous; and of divers other phænomena; with experimental illuſtrations.

Sketches of the author's theory of divers ſpontaneous decompoſitions, and of combuſtions, fulminations, and oft he agency of Fire or of concentrated Light, on bodies; illuſtrated by experiments, and numerous applications to chemiſtry and arts.

Suggeſtions from the premiſes, and the apparent repulſion ſubſiſting between Light and air, ſerving to explain all the phænomena of electricity, and to ſhew that the electric fluid is Light in a ſtate intermediate between the equable diffuſion of it and the concentrations of it which impreſs us with the ſenſe of heat.

Outlines of the author's theory of ſaturation illuſtrated by experiments: and explanations of the moſt ſtriking phænomena of combinations and decompoſitions, relative and reciprocal ſaturations, the extrication of elaſtic fluids, and the formation of the heterogeneal or compounded elaſtic fluids.

Obſervations on the relations of natural powers, to time and ſpace and quantity of matter; illuſtrated by inſtances and experiments.

General obſervations on gravity, denſity, fixity, volatility and other Phænomena which occur in almoſt all chemical operations.

Strictures on the newly revived doubts concerning the impenetrability of matter, and the evidence of our ſenſes; and on the imaginary converſions of matter.

General remarks on the action of diſtant bodies on each other, and on the circulations of matter, and on the perfection of thoſe laws of nature, by which the different bodies which conſtitute the ſolar ſyſtem appear to be preſerved from waſte and error.

SECTION II.

VITRIOLIC ACID.

SPECIMENS of the native ſubſtances which yield the vitriolic acid in the greateſt quantity, with obſervations on them.

The proceſs for obtaining the vitriolic acid from martial vitriol.

Obſervations on the acidulous water called dew of vitriol; the elaſtic fluids; the phlogiſtic acid; the ſpirit of vitriol; the concentrated acid called oil of vitriol; the concrete acid called glacial oil of vitriol, which are obtained ſeparately in this proceſs.

The rationale of this proceſs; and obſervations on the phænomena and products.

The art of dephlogiſticating and concentrating ſpirit of vitriol, with obſervations on the phænomena.

Obſervations on the methods of obtaining all the vitriolic acid of martial vitriol in the form of volatile ſulphureous acid and ſulphur: and inductions from theſe obſervations.

Specimens of ſulphureous minerals and native ſulphur; with obſervations on theſe, and on the art of preparing rough ſulphur, or brimſtone.

Divers proceſſes for obtaining vitriolic acid from ſulphur; with obſervations on the phænomena.

The theory of theſe proceſſes, and eſpecially of that now practiſed in manufactories.

Obſervations on the properties and uſes of the products, called aqua ſulphurata, ſpiritus ſulphuris per companam, ſpiritus ſulphuris, and gas ſulphuris.

The proceſſes for dephlogiſticating and concentrating the products of the foregoing proceſſes, to prepare concentrated vit. acid called oil of vitriol.

Experiments ſhewing how the phlogiſton is detached from the acid of ſulphur in theſe operations, and what happens to the phlogiſton thus detached, and to the atmoſpheric air or the air of nitre uſed on theſe occaſions.

Obſervations on the particulars in which the concentrated acid obtained from ſulphur, differs from that which is prepared from martial vitriol, and on the different properties and uſes of vit. acid, and volatile vit. acid or gas ſulphuris, which is to be treated of more fully.

Obſervations on the phænomena produced by expoſing vitriolic acid to the open air, and by mixing it with water and with ice; and inductions concerning the production of heat and cold.

Divers proceſſes for combining vitriolic acid with fixed vegetable alkali, to produce the neutral ſalt called vitriolated tartar, arcanum duplicatum, ſal de duobus, or polychreſt of Glaſer. The phænomena of theſe proceſſes explained. The art of obtaining the moſt regular cryſtals of vitriolated tartar.

Obſervations on the properties and uſes of this ſalt.

Divers decompoſitions of vitriolated tartar, and particularly by means of phlogiſton; and experiments ſhewing the acid again combined with phlogiſton and forming artificial ſulphur.

Divers proceſſes for combining vitriolic acid with mineral alkali to produce the neutral ſalt called Glauber's ſalt.

The phænomena of theſe proceſſes explained. The art of obtaining the moſt regular cryſtals of this ſalt, and of making it truly neutral and fitteſt for medical uſe.

Obſervations on the dangerous errors of the common art of preparing Glauber's ſalt; on the properties and uſes of Glauber's ſalt; and on divers decompoſitions of it.

Divers proceſſes for combining vitriolic acid with volatile alkali to produce the neutral ſalt called vitriolic ammoniac; with explanations of the phænomena.

Obſervations on the properties of this ſalt, and on divers proceſſes for decompoſing it.

Experiments ſhewing the forcible attraction of vitriolic acid to the water and phlogiſton of divers compound bodies; with a view towards the theory of the following proceſſes.

Experiments ſhewing the reciprocal action of vitriolic acid and oils, reſins, ſugar, and other bodies containing much phlogiſton and ſome water; and particularly the heating, inſpiſſating, and charring of theſe ſubſtances; the production of inflammable elaſtic fluids, of volatile vitriolic acid, ſulphur, and ſaline compounds.

Experiments ſhewing the action of vitriolic acid and ſpirits of wine on each other.

The proceſs for making the water of Rabel; the proceſs for making *ſpiritus vitrioli dulcis*; the beſt proceſs for making vitriolic ether, and the oil of wine, and the anodyne liquor of Hoffmann; with obſervations on the phænomena of theſe proceſſes and on the products of them; and eſpecially on the permanently elaſtic fluids, the ſulphureous acid, the ethereal ſpirit, the pungent oil, the reſiduary coal, and its earth.

The author's proceſs for making the beſt *ſpirit. vit. dulcis*, or *acidum vitriolicum vinoſum* of the new Edinburgh pharmacopœia.

Experiments ſhewing divers properties of *ſpirit. vitrioli dulcis*; with obſervations on the uſes of it in medicine and in arts.

The proceſs for rectifying vitriolic ether; and experiments ſhewing divers properties of it; with obſervations on the uſes of it in philoſophical experiments, medicine and arts.

The proceſs for forming ether into oil.

General obſervations and inductions.

Experiments and obſervations more particularly relating to the volatile or ſulphureous acid, the circumſtances in which it is formed, the kinds of matter of which it is compoſed, and the particulars in which it differs from ſulphur.

Obſervations on the uſes of this volatile acid in medicine and arts.

Inductions concerning the identity of the phlogiſtic element, and the properties whereby it induces volatility, colour, odour, and other qualities in compound bodies, and in many of theſe bodies, exhilerant, antiſpaſmodic, narcotic, and deleterious properties.

Divers proceſſes for combining volatile vitriolic acid with fixed vegetable alkali, to form the neutral ſalt called ſulphureous ſalt of Stahl.

Proceſſes for effecting a partial or total decompoſition of this ſalt; with obſervations on the phænomena, and particularly on the tranſlation of the phlogiſton to air or other bodies, and on the effects of it in theſe bodies.

Obſervations on divers properties of the ſulphureous ſalt of Stahl.

Experiments and obſervations tending to eſtabliſh the author's notions of attraction, repulſion, ſaturation, and of the repugnance of phlogiſton to water.

Divers proceſſes for combining volatile vitriolic acid with mineral alkali, and for decompoſing this neutral ſalt.

The phænomena of theſe combinations and decompoſitions explained, according to the author's notions, delivered in the introductory lectures.

Divers proceſſes for combining volatile vitriolic acid with volatile alkali.

Decompoſitions of this ſalt.

The phænomena of theſe combinations and decompoſitions explained, according to the author's notions.

Obſervations on the phænomena which ſhew the pureſt vitriolic acid to be a compound; and which ſhew the different kinds of matter which, with acid, conſtitute the vitriolic acid.

The proceſs for making flowers of ſulphur, and waſhed ſulphur. The art of rendering ſulphur ſoft and plaſtic, for taking off impreſſions, and for other uſes. The art of exhibiting the cryſtalization of ſulphur.

Experiments and obſervations ſhewing divers properties of ſulphur; and obſervations on the uſes of ſulphur in chemiſtry, medicine, and arts.

Experiments ſhewing divers phænomena reſulting from the action of cauſtic vegetable alkali on ſulphur, with obſervations relative to water, phlogiſton and fire.

The author's proceſs for combining ſulphur with fixed vegetable alkali, to prepare the beſt liver of ſulphur. The proceſs for preparing liquid hepar ſulphuris; with obſervations on the phænomena occurring in theſe proceſſes.

Experiments ſhewing the reciprocal agency of air and theſe compounds on each other, and the changes of hepar ſulphuris to ſulphureous ſalt of Stahl, or vitriolated tartar.

Philoſophical and medical obſervations concerning air phlogiſticated in theſe and in other proceſſes.

General inductions.

Obſervations on ſulphureous minerel waters; and proceſſes for preparing waters containing the ſame principles, and poſſeſſing the ſame medical virtues.

The proceſs for making lac ſulphuris or magiſtery of ſulphur; with obſervations on the phænomena and products.

Experiments ſhewing the elaſtic, inflammable, inviſible fluid, which is freely imbibed by water, and ſhewing divers properties of it diſcovered by the author.

Inductions concerning phlogiſton.

The proceſs for combining ſulphur with mineral alkali, to form the mineral alkaline liver of ſulphur.

The proceſs for combining ſulphur with volatile alkali, and making the volatile liver of ſulphur, or ſmoaking liquor of Boyle.

Obſervations on the phænomena and products of this proceſs, and particularly on the ſingular elaſtic fluid, which, received in water, makes the ſmoaking liver of ſulphur.

Proceſſes for combining ſulphur with ſpirit of wine, to produce the common tinctura ſulphuris, and other ſpirituous tinctures of ſulphur; with obſervations.

Proceſſes for combining ſulphur with oils, to form *balſamum ſulphuris ſimplex*, *balſamum ſulphuris craſſum*, *balſamum ſulphuris barbadenſe*, *balſamum ſulphuris terebinthinatum*, *balſamum ſulphuris aniſatum*, and Ruland's balſam of ſulphur. Obſervations on the phænomena of theſe proceſſes, and on the uſes and abuſes of ſuch medicines, and the injudicious methods in which ſeveral of them are uſually prepared.

Obſervations on the preparation and uſes of ſulphureous ointments, troches and other ſulphureous pharmaceutical compounds; and obſervations on the proceſſes of the London and Edinburgh pharmocopœia for preparing ſeveral of the foregoing medicines.

SECTION III.

NITROUS ACID.

SPECIMENS and hiſtory of the native ſubſtances which contain nitrous acid in conſiderable quantity.

Theory of the manufacture of rough nitre, with obſervations on the probable means of introducing it in this country.

The proceſſes for purifying rough nitre, with obſervations on the phænomena, and the product of theſe proceſſes.

The proceſſes for making cryſtal mineral, ſal prunellæ, and ſal polychreſt of the Edinburgh pharmacopæia, with obſervations thereon.

The proceſſes for obtaining the nitrous acid from nitre, in various degrees of concentration and purity; and thoſe particularly for preparing the ſpirit of nitre, or aqua fortis, Glauber's ſmoaking ſpirit of nitre, the blue and green ſpirits of nitre, and the author's highly concentrated and colourleſs nitrous acid.

Obſervations on the phænomena and products of theſe proceſſes, and particularly on the nitrous elaſtic inviſible fluid called nitrous gas.

The purification of nitrous acid.

Divers experiments of the author for decompoſing the nitrous acid, and ſhewing the different kinds of matter of which it is compoſed, and particularly the quantity of pure air which it contains, and the condition of the acid when diveſted of this air, and the effects of different quantities of phlogiſton combined with theſe.

Experiments ſhewing divers properties of nitrous vapour and of nitrous gas, and explanations of the phænomena of theſe experiments.

Experiments ſhewing the action of divers nitrous bodies on ignited combuſtible bodies, and the cauſes of the inefficacy of ſome nitrous bodies.

Experiments of the author ſhewing the analyſis of the nitrous elaſtic inviſible fluid, called nitrous gas, and exhibiting the pure air and other principles of it.

The phænomena of the mixtures of this fluid with air, and with other bodies, and all the other phænomena hitherto obſerved in the experiments made with this fluid, explained according to the author's premiſed notions of the elementary parts of it.

Experiments ſhewing the reciprocal action of nitrous acid, or its vapour, and divers phlogiſtic bodies on each other, and particularly the inſpiſſation, charring and inflammation of oils by this acid; and the liquefaction of camphor, or acidulated oil of camphor.

The phænomena of theſe experiments explained according to the premiſſes.

Experiments ſhewing the action of nitrous acid on ſpirit of wine in various circumſtances.

The proceſſes for preparing dulcified ſpirit of nitre, and nitrous ether.

Obſervations on the elaſtic fluids, and other products, and the phænomena of theſe proceſſes.

Experiments ſhewing the extreme volatility, inflammability, menſtrual powers, and other properties of nitrous ether, and the properties of its inviſible vapour, improperly called inflammable air.

Theſe phænomena explained according to the premiſſes.

Obſervations on the uſes of nitrous ether in medicine and arts.

Divers proceſſes for combining nitrous acid with fixed vegetable alkali to form nitre.

Experiments ſhewing that nitrous ſalts aſſiſt in the combuſtion of bodies in the ſame circumſtances of ignition, in which air acts thus on them, and in no others.

Obſervations on divers products of theſe experiments, and particularly on the fluids detached in them, and on the clyſſi of the antient chemiſts.

Experiments ſhewing that nitrous ſalts act towards the combuſtion of bodies, rapidly or ſlowly, in proportion as theſe are more or leſs intimately mixed in due quantity, or as their aggregation is broken by ignition.

The proceſs for making common gun-powder and white gun-powder.

The proceſs for making fulminating powder and divers fulminating compounds.

Obſervations on the choice of materials for theſe purpoſes and the proportions and other particulars to be obſerved in the mixture of them; with obſervations on the combuſtion and exploſions of them in different circumſtances.

The author's explanation of phænomena of the foregoing ſlow, accelerated, and rapid combuſtions; and of theſe detonations and exploſions; according to the premiſed notions of the kinds of matter concerned in theſe experiments.

Experiments ſhewing the inflammation of gunpowder in the open air, without exploſion; and the phænomena of gun-powder heated in vacuo; with obſervations.

Obſervations on the uſes of nitre for culinary purpoſes, and in medicine and divers arts.

Divers proceſſes for combining nitrous acid with mineral alkali, and forming cubic or quadrangular nitre.

Obſervations on the properties of this neutral ſalt, and the probable advantage of uſing it inſtead of nitre for certain purpoſes.

Divers proceſſes for combining nitrous acid with volatile alkali to form the neutral ſalt called nitrous ammoniac.

Obſervations on the properties of this ſalt, on the erroneous notions of Chemiſts concerning it, and on the uſe of it in medicine.

Experiments of the author, ſhewing the analyſis of this ſalt by fire and water; and exhibiting the air of it, and the condition of the acid diveſted of that air; and divers intereſting phænomena.

General inductions.

The proceſs for decompoſing vitriolated tartar by means of nitrous acid, with the author's ſolution of the phænomena.

Obſervations on the proceſſes of the London and Edinburgh pharmacopæiæ, for preparing ſeveral of the foregoing medicines, and other compounds containing nitrous acid or nitrous ſalt.

SECTION IV.

MARINE ACID.

SPECIMENS of the native ſubſtances which contain marine acid in conſiderable quantity; with obſervations on theſe, and particularly on ſal gem or foſſile ſalt, or rock ſalt, and on bay ſalt.

Obſervations on the manufacture of common ſea ſalt and on the contents of ſea water.

The proceſs for purifying ſea ſalt for chemical uſe, and for the more effectual preſervation of fleſh meat; with obſervations on the products.

Obſervations on the experiments made with a view to render ſea water freſh and palatable.

The proceſs for obtaining marine acid, or ſpirit of ſalt from ſea ſalt.

Obſervations on Mr Woulfe's and the author's methods of conducting diſtillations, and procuring this acid in the higheſt degree of concentration; with obſervations on the effects of atmoſpheric preſſure on bodies, containing, or in the act of receiving, repellent matter of any kind; and on divers phænomena of this proceſs; and on the products of it, particularly the Glauber's ſalt, the ſpirit of ſalt, the elaſtic inviſible acid fluid, and the ſpirit of ſalt made by receiving this fluid in cold water compreſſed.

Experiments ſhewing divers properties of this acid elaſtic fluid; and illuſtrating the author's notions of the homogeneity or purity of the acid matter in this, compared with other acid or acidulous elaſtic fluids.

Experiments ſhewing the ratio in which the atoms of this fluid repel each other at different diſtances of them, and the forces wherewith they are attracted, and the acid fluid is condenſed by water, and other bodies.

Inductions from theſe experiments confirming the author's notions of attraction, repulſion and ſaturation.

Experiments ſhewing the production of heat and cold, and other phænomena, by the action of this acid matter and water or ice, on each other.

The author's reaſons for not uſing the modern name of acid air.

Divers proceſſes for combining marine acid with mineral alkali and forming ſea ſalt.

Experiments ſhewing divers properties of ſea ſalt.

The decrepitation and fuſion of ſea ſalt for chemical purpoſes, with obſervations.

Divers proceſſes for combining marine acid with fixed vegetable alkali, and forming the neutral ſalt called regenerated ſea ſalt or febrifuge ſalt of Sylvius, or ſpiritus ſalis marini coagulatus.

Obſervations on the properties of this ſalt.

Divers proceſſes for combining marine acid with volatile alkali and forming the neutral ſalt called ſal ammoniacus.

Reaſons for deferring the further conſideration of this ſalt to a future period of the courſe.

Experiments ſhewing the action of the acid elaſtic fluid, and of common ſpirit of ſalt, on oils and other phlogiſtic bodies.

Obſervations on the phænomena of theſe experiments and on the products of them; and particularly on the elaſtic inflammable fluid generated in them.

The uſual proceſs for making dulcified ſpirit of ſalt, with obſervations.

The proceſſes for effecting a real combination of ſpirit of wine with this acid, and for forming marine ether, and the beſt dulcified ſpirit of ſalt.

Obſervations on the phænomena occurring in theſe proceſſes of the Marquis de Courtanvaux, Mr. Woulfe, and the Author.

Experiments ſhewing divers properties of marine ether.

The proceſs for making aqua regia, with obſervations thereon.

Divers proceſſes for blending marine acid with nitrous acid, and nitrous phlogiſticated acid or nitrous elaſtic fluid in various proportions, to prepare active menſtrua of metallic and other bodies.

The phænomena of theſe proceſſes explained.

Obſervations on the pharmacopœiæ of London and Edinburgh ſo far as they relate to the ſubjects of this lecture.

Experiments and obſervations on the compound ſaline ſubſtance called ſandiver or glaſs gall.

SECTION V.

ACETOUS ACID, VINOUS LIQUORS, and ARGOL.

SPECIMENS of the ſubſtances employed in making vinous liquors; with obſervations on them.

The author's theory of vinous, acetous and putrefactive fermentation, and of animal fermentation; illuſtrated by experiments.

Obſervations on divers products of theſe fermentations; and particularly on beer, cyder, wine, vinegar, their dregs or lees, tartar, yeaſt, and leaven.

The proceſſes for obtaining ſpirit of wine from vinous liquors; with obſervations on the cauſes of the different flavours, and diſtinctions of vinous ſpirits, ſuch as malt ſpirit, rum, brandy, arrack, and the compounds uſed as cordials.

The proceſſes for rectifying ſpirits, and for preparing alkohol, with obſervations on the products of them.

Obſervations on divers properties and uſes of vinous liquors, ſpirits and alkohol.

Obſervations on the differences, properties, and uſes of the vinegar of wine, corn, and other vegetable ſubſtances.

The proceſſes for purifying vinegar, and for preparing diſtilled vinegar; with obſervations on the products.

The proceſſes for concentrating vinegar, and for making radical vinegar, or concentrated acetous acid.

Obſervations on the phænomena and products of theſe proceſſes, and particularly on the pyrophorus of the author, the ſulphureous acid, ſulphur, and elaſtic fluid formed in theſe proceſſes.

Experiments ſhewing that acetous acid, in the higheſt ſtate of purity, is a compound of water acid matter and phlogiſton.

Obſervations on divers properties and uſes of acetous acid.

Experiments intended to ſhew the changes of acetous acid to the elaſtic fluid commonly called fixable air, and to aſcertain the compoſition of that elaſtic fluid.

Proceſſes for combining acetous acid with fixed vegetable alkali, and for preparing ſal diureticus or regenerated tartar or terra foliata tartari.

Obſervations on the phænomena of theſe proceſſes, and on the properties and uſes of this ſalt.

The decompoſition of terra foliata tartari by fire, and obſervations on the phænomena, with a view to the foregoing opinion of the author concerning the elaſtic acidulous fluid commonly called fixable air.

The preparation of the antiſeptic or prophylactic mixture; with obſervations on the common injudicious method of uſing vinegar to ſweeten hoſpitals and ſhips.

Proceſſes for combining acetous acid with mineral alkali, to make mineral alkaline acetous ſalt; with obſervations on theſe.

Proceſſes for combining acetous acid with volatile alkali to make ſpiritus Mindereri or acetous ammoniacal ſalt.

Expe-

Obſervations on the properties and uſes of theſe; and on certain experiments of the author.

Experiments ſhewing the action of the concentrated acetous acid on oils and other phlogiſtic bodies.

Obſervations on the phænomena, the elaſtic fluids and other products of theſe proceſſes.

Experiments ſhewing the action of acetous concentrated acid on alkohol.

The proceſſes for making dulcified ſpirit of vinegar and acetous ether.

Obſervations on the phænomena and products of theſe proceſſes.

Experiments ſhewing the properties of acetous ether, with obſervations on the uſes of it.

Obſervations on the preparations of the London and Edinburgh colleges, in which the acetous acid is uſed.

Obſervations on red and white tartar or argol.

Proceſſes for purifying tartar to make cryſtals of tartar, and cream of tartar.

Experiments ſhewing the vulgar analyſis of purified tartar, and particularly the water, and phlegmatic liquor called ſpirit of tartar, the oleaginous matter, the acidulous elaſtic fluid, the other elaſtic fluids, and the phlogiſtic alkaline and earthy coal of it.

Obſervations on the phænomena; and on the properties and uſes of theſe products.

Obſervations on the properties and uſes of tartar, and on the arts of facilitating the ſolution of it in ſmall quantities of water.

Other proceſſes for the true analyſis of tartar; with obſervations on the phænomena and products, and particularly on the alkali and phlogiſtic matter and acidulous gas of tartar.

The common proceſs for combining tartar with fixed vegetable alkali, and forming ſoluble tartar, or tartar tartarized.

Obſervations on the phænomena of this proceſs, and on the properties and uſes of this ſalt.

The beſt proceſs for combining tartar with mineral alkali, and for forming ſal Rupelenſis, or ſel de Seignette, in large cryſtals.

Obſervations on the phænomena of this proceſs, and on the properties and uſes of this ſalt.

Proceſſes for combining tartar with volatile alkali, and forming the tartarous ammoniacal ſalt.

SECTION VI.

ANOMALOUS ACIDS, and PHOSPHORIC ACID.

PROCESSES for exhibiting the vulgar analyſis of divers farinaceous and ſaccharine bodies, by fire only.

Obſervations on the phænomena and various products of theſe proceſſes.

Compariſons of theſe products with thoſe, which by fermentation, and by other means, are obtainable from the ſame farinaceous and ſaccharine ſubſtances: and arguments ſhewing why the author rejects many concluſions drawn from the vulgar analyſis; and why, in teaching, he does not enumerate, or treat of, the ſeveral acidulous liquors, or acidulous and eſſential ſalts, obtainable from vegetable ſubſtances, until the chemical principles are better known to the audience.

Obſervations on the acid of ants and other inſects, and on other animal acids of the chemiſts; and reaſons for deferring the conſideration of them.

Obſervations on the fluor acid; and the author's reaſons for deferring the conſideration of this acid to another part of the courſe.

PHOSPHORIC ACID.

Obſervations on the animal and vegetable matters which contain phoſphoric acid in conſiderable quantity; and ſuggeſtions concerning mineral bodies which ſeem to contain it.

Obſervations on the ſecretion of human urine, and the differences obſervable in this liquor, in different circumſtances of ſecretion and excretion.

Proceſſes for exhibiting the analyſis of urine, and the properties which render it uſeful in divers arts; and particularly the proceſſes for obtaining the alkaline and ſaponaceous ſpirit of urine, the extract, the microcoſmic ſalts, the ammoniacal ſalt, the ſea ſalt, and divers other neutral ſalts, with baſes of volatile and fixed alkali, the fluor and concrete volatile alkali, the oil, the charred coal, and dephlogiſticated earth of urine.

Obſervations on theſe products, and particularly on the microcoſmic ſalt of urine.

The proceſs for obtaining the ſolid and tranſparent phoſphoric acid from the microcoſmic ſalt, called alſo the native or eſſential, or phoſphoric ſalt of urine.

Experiments ſhewing the fixity, and divers other properties of this acid, with obſervations on the uſes of it.

Experiments ſhewing divers decompoſitions of neutral ſalts by phoſphoric acid, *in the dry way:* compariſons of theſe with the action of the ſame acid in the humid way; and explanations of the phænomena.

The proceſſes for combining phoſphoric acid with fixed vegetable alkali to make neutral vegetable alkaline phoſphoric ſalt.

The proceſſes for combining phoſphoric acid with mineral alkali, to make mineral alkaline neutral phoſphoric ſalt.

The proceſſes for combining phoſphoric acid with volatile alkali to recompoſe microcoſmic ſalt.

Obſervations on theſe proceſſes, and the products of them.

Obſervations on the uſual proceſſes for combining phoſphoric acid with phlogiſton to make the phoſphorus of Kunckel.

The author's proceſs for making this phoſphorus from urine.

Obſervations on the phænomena and products of this proceſs; and particularly on the elaſtic inflammable fluid firſt noticed by Doctor Brockleſby.

The proceſſes for obtaining the phoſphoric acid from bones and ſolid parts of animals, in great quantity, with obſervations on the phænomena and products; and the proceſs for making phoſphorus of Kunckel from the phoſphoric acid of bones, with the phlogiſton of charred muſtard, or of metals, or of other bodies.

The proceſs for purifying and blanching phoſphorus of Kunckel, with obſervations on the injudicious operations directed by the chemical writers, for this purpoſe.

Divers experiments of the author, and of others, made with phoſphorus, and with other bodies which are dephlogiſticated by expoſure to the atmoſpheric air; in order to illuſtrate the author's notions of attraction and repulſion, and of air, phlogiſton and light, and of combuſtion, fire, flame, and illumination.

Experiments of the author made in 1773, ſhewing that phoſphorus of Kunckel doth not ſhine or burn in the Torricellian void; and that it ſhines or burns in proportion to the quantity of air and the degree of heat to which it is expoſed.

Divers Experiments ſhewing the agency of nitrous acid towards the decompoſition and combuſtion of phoſphorus of Kunckel.

Experiments ſhewing the changes produced in air, by its combination with phlogiſton; and ſhewing the properties of the elaſtic fluid called phlogiſticated air.

Inductions confirming the author's notions of ſaturation, and of the elaſticity of compound elaſtic fluids, and of the agency of air in combuſtions and other decompoſitions, and in reſpiration.

Œconomical and medical obſervations on candle light, fires, ſtoves, and the ſtructure of dwelling-houſes; on great cities, on ſeaſons, on particular diſtricts, on trades, and divers other ſubjects.

The proceſſes for combining phoſphorus with divers bodies, and particularly for preparing phoſphoric ſulphur, phoſphoric oils, phoſphoric balſams, and phoſphoric pencils; with obſervations on theſe.

Obſervations on the food of animals, from whoſe ſolid and fluid parts, ſalts, containing phoſphoric acid, may be obtained: obſervations on the proceſſes in which the greateſt quantity of ſuch ſalts may be obtained from theſe parts of animals: obſervations on the properties of phoſphoric acid, and on the matter left in the decompoſitions of phoſphorus; all tending to ſhew that the phoſphoric acid is a compound body.

Obſervations on the foregoing proceſſes and products, and on the animal œconomy, and on the analyſes made by the author of the urine of diſtempered perſons; and divers other obſervations tending to prove the advantages of experimental examinations of urine, towards the diagnoſis of diſeaſes.

SECTION VII.

TINCAL and SEDATIVE SALT.

SPECIMENS and hiſtory of tincal borax and ſedative ſalt.

Obſervations on the experiments of chemiſts on theſe ſubjects, and on their reaſons for conſidering ſedative ſalt as an acid.

Obſervations on the inſufficiency of our knowledge of theſe ſubjects; and the author's reaſons for treating of them in the preſent order, contrary to his opinion of them.

The author's proceſs for purifying tincal; with obſervations on the proceſſes of others, and on India refined tincal.

The author's proceſs for making borax, with obſervations on the proceſſes deſcribed by chemiſts.

The art of reducing tincal or borax to a tranſparent ſolid maſs, called glaſs of tincal, or glaſs of borax.

Obſervations on the differences between refined tincal and borax, and on the uſes of them.

The calcination of borax for ſoldering, aſſaying, and to render it ſtrongly phoſphoreſcent.

The proceſſes for decompoſing refined tincal, or borax, and preparing the ſalt called ſedative ſalt by ſublimation, or flowers of borax, or volatile narcotic ſalt: and the proceſſes for preparing ſedative ſalt by cryſtalization.

Obſervations on the phænomena and products of theſe proceſſes; and particularly on the properties and uſes of ſedative ſalt.

The reduction of ſedative ſalt to a tranſparent colourleſs maſs called glaſs of ſedative ſalt.

The proceſs for combining ſedative ſalt with mineral alkali to recompoſe borax; with obſervations thereon.

The common proceſs directed by chemiſts, for combining ſedative ſalt with fixed vegetable, and with volatile alkali, to make vegetable alkaline and ammoniacal tincal; and experiments with a view to make other combinations, and to inveſtigate the true character and compoſition of ſedative ſalt.

Obſervations on the pharmaceutical preparations in which borax or ſedative ſalt is uſed.

SECTION VIII.

Fixed Vegetable Alkali.

SPECIMENS of the bodies which yield fixed vegetable alkali in the greateſt quantity; with obſervations on theſe, and on divers others which contain this alkali.

The proceſſes for obtaining in different conditions the greateſt quantities of the alkali of divers vegetable ſubſtances; and for preparing Engliſh pot-aſh, pearl-aſh, or cineres clavellati, cendre gravelée, the alkaline coal or tartar of wine and tartar of Britiſh vinegar.

The proceſſes for preparing the common ſalt of wormwood, black flux, white flux, or nitre fixed by tartar, nitre alkalized or fixed by coals, nitre alkalized or fixed per ſe, and ſalt of tartar.

Obſervations on the phænomena and products of theſe proceſſes; and eſpecially on the differences of theſe alkaline ſubſtances.

General obſervations on lixiviation, ſolution, filtration, evaporation, exſiccation and calcination.

The arts of preparing the pureſt vegetable alkali, from divers ſubjects, for technical uſes; particularly for experiments, dyeing, fine glaſſes, and falſe jewels or paſtes.

The proceſs for preparing deliquiated alkali, or oleum tartari per deliquium.

Obſervations on the phænomena of this proceſs, and on the particulars in which oleum tartari per deliquium differs from a direct ſolution of the alkaline ſalt in common water.

The proceſſes for combining the ſalt of tartar, and the fixed alkaline ſalts obtained from other ſubſtances, with the acidulous elaſtic fluid called fixable air, to form the mildeſt fixed vegetable alkaline ſalt, or cryſtals of vegetable alkali.

The proceſſes for diveſting fixed vegetable alkalies of the acidulous elaſtic fluid, to render them cauſtic, and to prepare ſoap-lees, and lapis infernalis or lapis ſepticus or cauterium potentiale.

The preparation of cauſticum commune fortius and cauſticum commune mitius.

Experiments ſhewing divers properties of the elaſtic fluid called acidulous or fixable gas; accompanied with explanations of the numerous phænomena which this elaſtic fluid preſents in different proceſſes.

The action of alkaline and other cauſtics explained according to the author's notions of attraction.

Obſervations on ſeveral of the foregoing phænomena, and experiments ſhewing that the pureſt fixed vegetable alkali is a compound body, in which alkaline matter predominates.

Obſervations on the foregoing proceſſes and experiments, ſhewing that fixed vegetable alkaline matter exiſts in all thoſe bodies from which we obtain it by incineration, and that it is not the creature of fire.

Experiments with the mild fixed vegetable alkali, and the cauſtic vegetable alkali, ſhewing divers properties and uſes of them.

Proceſſes for impregnating fixed vegetable alkali with the phlogiſtic matter of blood and of other bodies, to prepare the phlogiſtic alkali frequently uſed in experiments, and in making Pruſſian blue.

Experiments ſhewing the action of cauſtic fixed vegetable alkali on oleaginous and reſinous bodies; and proceſſes for making almond ſoap of the London College, ſoft ſoap, black ſoap, and other ſoaps.

Obſervations on the phænomena of theſe proceſſes.

The proceſſes for combining cauſtic fixed vegetable alkali with eſſential oils, and for making Starkey's ſoap, or philoſophic ſoap or ſapo tartareus.

Obſervations on the mixture called chaos.

Obſervations on the phænomena of theſe proceſſes, and on the properties and uſes of the products.

Divers proceſſes for combining cauſtic vegetable alkali with alkohol, and for preparing tartarized ſpirit of wine, tincture of ſalt of tartar and lilly of Paracelſus.

Obſervations on the phænomena of theſe proceſſes and on the uſes of the products.

Medicinal obſervations on fixed vegetable alkali and on the pharmaceutical compounds which contain it in combination with native vegetable acid, or uncombined: And Strictures on the uſe of cauſtic vegetable alkali, as a lithontriptic.

SECT.

SECTION IX.

Mineral Alkali.

SPECIMENS of Natron or Natrum or Nitrum of the ancients, or Nitrum Ægyptiacum and divers ſorts of foſſile mineral alkali; and of divers animal, vegetable and mineral bodies, which contain mineral alkali in conſiderable quantity; with obſervations on them.

The proceſſes for extracting the mineral alkali from impure natron, eſſloreſcence of natron, and the foſſile alkaline compounds.

Obſervations on the attempts for extracting the mineral alkali of ſea ſalt; and on the proceſſes in which ſea ſalt, by reaſon of its foſſile alkali, is advantageouſly uſed in the place of foſſile alkali.

The proceſſes for obtaining in different conditions the greateſt quantity of this alkali from divers other ſubſtances; and for preparing kelp, barilla or ſoda and burnt ſponge.

Obſervations on the phænomena and products of theſe proceſſes, and on the differences of the mineral alkaline ſalts obtained in them; with remarks on the uſe of burnt ſponge in medicine.

The art of preparing the pureſt cryſtals of mineral alkali from the foregoing impure ſaline bodies.

Proceſſes for diveſting the cryſtals of mineral alkali or ſal ſodæ, of the fixable gas, to render it cauſtic, and to prepare cauſtic mineral alkali, or mineral ſoap-lee: and proceſſes for reſtoring the fixable or acidulous gas to cauſtic mineral alkali, to form mild cryſtals of mineral alkali.

Obſervations on the phænomena of theſe proceſſes, with explanations.

Obſervations and experiments tending to ſhew that the pureſt fixed mineral alkali is a compound body in which akaline matter predominates.

Experiments and obſervations ſhewing that fixed mineral alkali, or its alkaline matter, exiſts in all thoſe bodies from which we obtain it by incineration, and that it is not the creature of fire.

Experiments with the mild and cauſtic mineral alkali, ſhewing divers properties and uſes of them.

Obſervations on the medicinal uſe of mineral alkali.

Experiments ſhewing the action of cauſtic mineral alkali on oleaginous and reſinous bodies; and the reaſons why mineral alkali is uſed by the ſoap makers in their ſoap-lees.

The proceſſes for making extemporaneous ſoaps and the beſt hard ſoap or Windſor ſoap, hard almond ſoap, Caſtile ſoap or olive ſoap, green Venetian ſoap, common Engliſh ſoap, and divers other ſoaps containing oleaginous or reſinous matter.

Obſervations on the rationale, the phænomena and products of theſe proceſſes.

The proceſſes for diſſolving ſoap in ſpirit of wine and for ſweetening and purifying ſoaps.

Obſervations on the properties and the technical and medicinal uſes of ſoap.

The art of preparing coloured waſh-balls, ſhaving powder, perfumed ſaponaceous compounds, and black ſoap.

The proceſſes for decompoſing ſoaps, with obſervarions on the alterations produced in the oleaginous matter of them.

Œconomical obſervations and advices concerning the uſe of ſoap, and the correction of hard waters.

Obſervations on the preparation and uſe of *lotio ſaponacea*, *linimentum ſaponaceum*, *emplaſtrum e ſapone*, *balſamum ſaponaceum*, or opodeldoc, *electarium deobſtruens*, *electarium ſaponaceum*, *lohoch ſaponaceum*, *pilulæ ſaponaceæ*, *pil. aloeticæ*, *pilulæ ſcilliticæ*; and on the other pharmaceutical compounds which contain ſoap; with cautions relative to medical preſcription.

Strictures on the alkaline and ſaponaceous medicines called lithontriptics.

SECTION X.

Volatile Alkali.

SPECIMENS of divers animal, vegetable, and mineral ſubſtances which yield volatile alkali in conſiderable quantity; with obſervations on them.

The proceſſes for obtaining and rectifying the volatile alkali of hartſhorn, to make ſpirit of hartſhorn, and volatile ſalt of hartſhorn.

Obſervations on the phænomena and products of theſe proceſſes, and particularly on the elaſtic fluids, the charred hartſhorn, called hartſhorn black, and the oil called oleum animale.

The calcination of hartſhorn black to prepare calcined hartſhorn.

The rectification of the oil and preparation of oleum Dippelii.

The proceſſes for obtaining and rectifying the volatile alkali of ivory, to prepare the alkaline ſpirit and concrete volatile alkaline ſalt of ivory.

Obſervations on the phænomena and products of theſe proceſſes, and particularly on the elaſtic fluids, the charred ivory, called ivory-black, and the oil of ivory.

The proceſſes for obtaining the fat oil of bones, the diſtilled oil and volatile alkaline liquor of bones, the black of bones and bone-aſh.

The proceſs for rectifying the alkali of bones, and preparing the liquor ſold under the name of ſpirit of hartſhorn, and the dry ſalt called ſalt of hartſhorn.

Obſervations on the phænomena of the foregoing proceſſes.

Obſervations on ſpecimens of the alkaline, the oleaginous, the earthy, and other products of ox-blood, human blood, and urine; and obſervations on the ancient preparations, called ſal et oleum viperinum, ſal et oleum cranii humani; &c.

The proceſſes for obtaining the volatile alkali, and oil of divers vegetable ſubſtances, and particularly of muſtard, opium and tobacco.

Obſervations on the phænomena of theſe proceſſes.

Obſervations on the medicinal virtues of theſe ſubſtances in compariſon with thoſe of their products.

Obſervations on the volatile alkali, obtainable in ſmall quantity, from tartar, terra foliata tartari, and divers other ſubſtances.

The proceſſes for obtaining the volatile alkali, and oil, of wood ſoot, called ſpiritus et oleum fuliginis, and the ammoniacal ſalt of ſoot.

Obſervations on combuſtion and the cauſes of ſmoak, with experiments ſhewing how to prevent ſmoak in furnaces.

Obſervations on ſoot, biſtre and lamp-black.

Obſervations on the Egyptian proceſs for making and purifying ſal ammoniacus, and on the proceſſes of Britiſh artiſts for making the beſt ſal ammoniacus, and Glauber's ſalt at the ſame time; with experiments ſhewing the rationale and merits of this art, and the improvements that may be made in it.

Proceſſes for obtaining volatile alkali from coral, ſponge, and other marine productions; from volcanic productions; from foſſile wood, Bovey coal, Newcaſtle coal and other minerals.

Obſervations on the proceſſes of chemiſts, and experiments of the author ſhewing, that volatile alkaline matter exiſts in the bodies which yield volatile alkali by ignition, and that volatile alkali is not the creature of fire.

Divers proceſſes for combining volatile alkali with marine acid to make ſal ammoniac.

Obſervations on the phænomena and products of theſe proceſſes, and on divers properties and uſes of ſal ammoniac.

The proceſſes for obtaining the volatile alkali of ſal ammoniac in the form of elaſtic inviſible fluid called alkaline gas.

Divers experiments ſhewing the properties of alkaline gas, and the ratio in which its natural parts repel each other at different diſtances of them; and the attractive forces whereby they are drawn together, and condenſed and combined with water and other bodies: And experiments ſhewing the reciprocal condenſation and combination of alkaline gas and fixable gas, preſented to each other, and the formation of mild concrete volatile alkali; and the reciprocal condenſation and combination of alkaline gas and acid gas preſented to each other, and the formation of ſal ammoniac.

Divers proceſſes for detaching the alkaline gas of ſal ammoniac to meet fixable gas, and to compoſe mild volatile alkali, or concrete volatile alkali.

Divers proceſſes for diveſting mild volatile alkali of its fixable gas, and for obtaining alkaline gas, or cauſtic volatile alkali.

Obſervations on the differences of the properties of mild and cauſtic volatile alkali; and the cauſes of the different phænomena which they exhibit in divers operations.

Obſervations on the alkaline gas obtained in certain proceſſes, and on the phænomena which induce the author to believe that this gas conſiſts of uncompounded alkaline matter, and that all other bodies called alkalis are compound bodies in which this alkaline matter is prevalent.

General inductions from the foregoing experiments and obſervations; and explanations of divers phænomena; particularly volatility, fixity, ſaturation, heat and cold.

Explanations of the phænomena of water and other bodies ſurcharged with alkaline and other elaſtic fluids by means of atmoſpheric or mechanical preſſure; and of the phænomena of the mantling and ebullition of divers liquors in the exhauſted receiver of an air-pump; and of divers other phænomena occurring in pneumatic experiments; with obſervations on the management of air-pumps, and on the mercurial gauges now uſed.

Experiments ſhewing the condenſation and total abſorption of air, and of the other elaſtic fluids called gaſes, by porous ignited bodies.

Inductions.

The phænomena of the eſcape of alkaline and other elaſtic fluids out of water and vinous liquors expoſed to air, explained.

Mr. Woulfe's proceſs for obtaining the volatile alkali of ſal ammoniacus blended with water and called ſpiritus volatilis cauſticus, or ſpiritus volatilis ſalis ammoniaci cum calce; with obſervations on the phænomena, and particularly on his art of condenſing his alkaline gas in water; and on the more modern arts of exhibiting the like phænomena, and the long known properties of alkaline gas, as recent diſcoveries.

Obſervations on the ſpecific gravity of water highly charged with alkaline gas and other elaſtic fluids; and other obſervations, ſhewing, that bodies gravitate by virtue of the ſame attractive powers whereby they combine or cohere.

The beſt proceſſes for making the volatile ſalt of ſal ammoniacus, and the ſpiritus volatilis ſalis ammoniaci; with obſervations on them.

Divers experiments ſhewing ſingular decompoſitions and combinations reſulting from the compoſition of attractive forces only, or from theſe and the agency of fire and of repulſive powers; and ſhewing the author's method of eſtimating attractive and repulſive powers, to be nearly or accurately true, inaſmuch as it ſerves to explain the phænomena and bears the teſt of new experiments.

The proceſſes for impregnating the foregoing volatile ſalt with the ſpiritus rector of eſſential oils and odoriferous bodies, to prepare grateful cephalic ſalts, ſuch as are uſed in ſmelling-bottles.

Obſervations on the mixture of volatile ſpirit of ſal ammoniacus with alkohol, and on the precipitate called offa Helmontii.

Proceſſes for combining cauſtic volatile alkali with alkohol, and for preparing cauſtic alkohol.

The vulgar proceſs for preparing ſpirit ſalis ammoniaci dulcis; with obſervations on the phænomena and products.

The proceſſes for preparing dulcified ſpirit of ſal ammoniacus impregnated with grateful aromatics, to make ſpiritus volatilis aromaticus, and ſpiritus volatilis oleoſus, and ſpiritus volatilis ſuccinatus.

The proceſſes for preparing dulcified ſpirit of ſal ammoniacus impregnated with the fetid oil of aſafœtida to make ſpiritus volatilis fœtidus.

Obſervations on the differences and medicinal uſes of theſe volatile alkaline medicines, on their menſtrual powers, and on the uſe of volatile alkali in the perfumer's art.

Experiments ſhewing the action of the alkaline gas, and of the cauſtic volatile ſpirit of ſal ammoniacus on phlogiſtic compounds of the oily, reſinous and bituminous kind; with obſervations on the phænomena, and the volatile alkaline ſaponaceous products.

The beſt proceſs for making eau de luce, with obſervations on it.

Obſervations on the diſtinctions to be made in medicine and in arts, between the volatile alkali obtained directly from animal or vegetable ſubſtances by fire and impregnated with oil, and the volatile alkali obtained by other means from pure ſal ammoniacus.

Obſervations on the pharmaceutical preparations which contain volatile alkali, and particularly on tinctura volatilis, tinctura valeriana volatilis, tinctura coſtorei compoſita, elixir guaiacinum, tinctura corticis Peruviani volatilis, tinctura guaiacina volatilis, and tinctura fuliginis.

Obſervations on the preparation and uſes of linimentum volatile, epithema volatile; and enumeration of the improvements exhibited by the author in preparing ſeveral volatile alkaline medicines of the London and Edinburgh colleges.

SECTION XI.

CALCAREOUS EARTHS.

OBSERVATIONS on the different ſyſtematic arrangements of earthy bodies.

The author's arrangement of them.

Specimens of the purer calcareous bodies, with the technical diſtinctions, and obſervations on them, and eſpecially on chalk, limeſtones, calcareous marbles, calcareous gur or mineral agaric, and calcareous ſtalactites.

Experiments ſhewing divers properties and diſtinguiſhing characters of the mineral ſubſtances of the calcareous kind which burn to lime.

Experiments ſhewing the quantity of water, acidulous gas and phlogiſticated air, in the foregoing native ſubſtances, and ſeparable from the calcareous matter by the action of fire, whilſt theſe ſubſtances are reduced to quick-lime.

Experiments ſhewing that quick lime retains phlogiſton, inſeparable from it by fire only; and ſhewing the effect of this phlogiſtic matter on acids, air and other bodies.

Experiments ſhewing divers properties of quick-lime, prepared from mineral ſubſtances; with explanations of the phænomena.

Chemical and technical obſervations on oyſter-ſhells, cockle-ſhells, crab's-claws, egg-ſhells, pearl, the ſubſtance called crab's-eyes, and on the cruſtacoeus parts of divers aquatic and land animals, which burn to lime partially or totally.

The proceſs for making lime-water, with obſervations on the phænomena and products, and on the cream of lime:

lime; Experiments ſhewing the precipitation of calcareous earth, in the ſtate of lime, from lime-water.

Experiments ſhewing the reduction of quick-lime to the former condition of the native calcareous earth, and ſhewing the circumſtances in which ſolid ſtones and tranſparent ſpars may be formed by reſtoring to the calcareous matter what is expelled from it in calcination or ſolution.

Theory of the formation of ſtalactites and of the petrefaction of animal and vegetable ſubſtances.

Experiments ſhewing the tranſlation of the acidulous gas from divers bodies, in different ſeries, to lime; and from lime to other bodias.

Obſervations on the propoſal of Doctor Alſton for preſerving water ſweet at ſea.

Experiments ſhewing ſingular products firſt obſerved by the author, after the formation of lixivium ſapona rium, from the elixation of the reſiduary lime and ſaline matter.

Suggeſtions concerning an acid inherent in quick-lime.

Obſervations on divers bodies uſed for cementing, and the theory of their action.

Experiments and obſervations on mortar, ſhewing the true cauſes of its induration, and of its duration, and of the weakneſs and ſpeedy decay of the mortar commonly uſed.

Experiments of the author, ſhewing that good mortar is very little altered in weight or bulk, by ſetting and drying.

Obſervations on divers other phænomena of mortar, with practical inductions.

Obſervations on the cement made with lime and blood, or lime and whites of eggs, for mending broken veſſels; and on the glue cement uſed in ſome chemical experiments; and on the white lute and other lutes; and on the proper choice of lutes in chemical operations.

Experiments ſhewing the vitrification of the moſt apyrous and purer calcareous bodies by the ſole action of intenſe fires.

Experiments ſhewing the efficacy of borax and of ſedative ſalt and fuſible ſalt of urine and phoſphoric acid, in promoting the vitrification of calcareous earth; and the effect of ſandiver and of fixed ammoniac, and the inefficacy of fixed alkali and calx of lead, for this purpoſe; with general obſervations on vitrification and fluxes, and on the intumeſcence which precedes and accompanies vitrification.

Obſervations on the properties of glaſſes conſiſting chiefly of calcareous earth.

Specimens of the earthy bodies which conſiſt chiefly of calcareous earth and vitriolic acid, and are called gypſeous ſtones or ſpars; with obſervations on them, and particularly on alabaſter, the fibrous gypſum or Engliſh talc, glacies mariæ, iſland cryſtal, gypſeous ſpars, gypſeous ſtalactites and gypſeous marble.

Divers proceſſes for combining calcareous earth with vitriolic acid to form ſelenitic ſalt, or artificial gypſum; with obſervations on the phænomena of theſe proceſſes.

Experiments ſhewing divers properties of gypſeous earths; and the preparation of plaiſter ſtone to make plaiſter powder, and plaiſter of Paris.

Experiments of the author, ſhewing how liquid parget, or plaiſter of Paris, becomes ſuddenly indurated, by reaſon of polarity, and without any remarkable loſs by drying.

Obſervations on the arts in which plaiſter of Paris is uſed.

Obſervations on the artificial formation of ſelenitic or gypſeous ſtones, and on gypſeous ſtalactites, and the incruſtations of water-pipes and kettles.

Obſervations on the cauſes of the ſpeedy decay of gypſeous ſtones and marbles, alabaſter, and pleiſter of Paris, when they are expoſed to the weather; and on the cauſe of the bending of ſome marble chimney-pieces.

Proceſſes for combining calcareous earth with volatile vitriolic acid; with obſervations on the phænomena and products.

The proceſſes for preparing Canton's phoſphorus; phoſphori of Becaria and Wilſon, and other calcareous phoſphori; with obſervations on the agency of phlogiſton, in the production of coloured phoſphori.

Experiments ſhewing the action of lime and lime-water on divers phlogiſtic bodies, eſpecially on fat oils and ſulphur.

The proceſs for making calcareous liver of ſulphur, and lac ſulphuris calcareum, and calcareous magiſtery of ſulphur, or ſulphur præcipitatum.

Obſervations on the phænomena of theſe proceſſes, and on the products of them; and particularly on the claſtic fluid detached in making magiſtery of ſulphur.

Experiments ſhewing calcareous hepar deprived of its phlogiſton by the action of air; and ſhewing the air phlogiſticated, whilſt the reſiduary acid of ſulpur, and the calcareous earth from an incombuſtible ſalt called ſelenitic ſalt.

Experiments ſhewing divers decompoſitions of gypſeous bodies, and the reduction of them to the ſtate of quick lime.

Obſervations on water naturally or artificially impregnated with ſelenites, or calcareous ſalt, on the uſes and inconveniencies of this impregnation, and on the art of ſoftening hard waters.

Experiments ſhewing the eaſy vitrification of gypſeous bodies by reaſon of the acid which they contain; and the fluxes of theſe bodies; and the properties of their glaſſes.

Obſervations on ſemigypſeous ſtones and marble, their properties and uſes, and the changes which they undergo by fire.

Obſervations on ſolutions and calcinations of ſemigypſeous ſtones, and on marble powder.

Specimens of liver-ſtone and ſwine-ſtone, or calcareous earth in native combination with vitriolic acid and phlogiſton; with obſervations on them.

Specimens of Bolognian ſtone and of other ſpatoſe ſtones, conſiſting chiefly but not entirely of vitriolic acid and calcareous earth.

Experiments ſhewing the decompoſition and component parts of theſe.

The proceſs for preparing the Bolognian phoſphorus, and phoſphori of divers colours, with theſe ſtones.

Divers proceſſes for combining calcareous earth with marine acid to form liquid ſhell, marine calcareous ſalt, and the compound called fixed ammoniac, and the phoſphorus of Homberg, and the pellucid deliqueſcent glaſs of fixed ammoniac.

Obſervations on the phænomena of theſe proceſſes, and on the properties of their products.

General obſervations on the production of fire by friction or percuſſion, with the author's notions on this ſubject.

The author's notions of the cauſe of phoſphoreſcence, and phoſphoric colours.

Divers proceſſes for decompoſing the marine calcareous ſalt by ſingle and by compound elective attractions, to aſcertain the attractive powers of divers kinds of matter, and the effects of the co-operation and of the counteraction of attractive powers.

General obſervations on the phænomena of tranſparent fluids becoming ſolid on the mixture of them; called miraculum chemicum.

Specimens of the ſubſtances called fluors, which form the ſixth order of Cronſtedt; with obſervations on them.

Experiments ſhewing the phoſphoreſcent quality of heated fluors, and the circumſtances in which they looſe this property.

Experiments ſhewing the uſual partial analyſis of fluors, with obſervations on the products, and particularly on the calcareous earth, the argillaceous and ſiliceous earth, and the acid of them.

Experiments of the celebrated Scheele and of Mr. Boulanger, ſhewing the elaſtic acid fluid detached from fluors, decompoſed and condenſed in water; and explanations of the phænomena which have miſled ſome people into a belief that this acid, which they call fluor acid air, has the property of converting water into ſtone.

Divers experiments to ſhew other properties of fluor acid, and the ſaline compounds which it forms with other bodies, particularly alkalis; and to ſhew the phoſphoreſcent quality of theſe ſalts and divers properties of them.

Experiments of the author and of others, to ſhew the analyſis of the fluor acid, and the kinds of matter of which it conſiſts.

Experiments ſhewing the phoſphoreſcent quality obſerved by the author in the earth which conſtitutes a part of the elaſtic fluor acid.

Obſervations relative to the condition of matter of every kind, wherein it becomes inviſible, or viſible, and relative to divers notions of the author; and particularly thoſe concerning the identity of acid matter in the ſeveral acids of the chemiſts, and concerning phoſphoreſcence and colour.

Experiments ſhewing the vitreſcent properties of fluors, and the different glaſſes or enamels which they form with ſaline fluxes, with other earthy bodies, and without any addition; with obſervations on the uſes of them in aſſaying and metallurgy, and on the other uſes to which they are applicable.

Divers proceſſes for combining calcareous earth with nitrous acid, to make calcareous nitre.

The proceſs for making Baldwin's phoſphorus.

Obſervations on the phænomena of theſe proceſſes.

Obſervations on the nitrous efloreſcence formed upon walls, calcareous bodies, and in nitre beds; and on the calcareous nitre of divers waters; and on the properties of calcareous nitre.

Decompoſitions of calcareous nitre, with obſervations on the phænomena.

Proceſſes for combining calcareous earth with acetous acid to form acetous calcareous ſalt, with obſervations on theſe, and on the author's opinion of acetous acid and acidulous gas.

Experiments ſhewing the action of calcareous earth and cryſtals of tartar on each other; with obſervations on the products, illuſtrating the author's notions of tartar and the acidulous gas.

The combination of calcareous earth with phoſphoric acid, with obſervations thereon.

Obſervations on bone-aſh, calcined ivory and hartſhorn, and the calcined earth of other ſolid and fluid parts of animals, and on the uſes of them.

Experiments ſhewing the reduction of bone-aſh and of the other animal earthy bodies to the ſtate of quick lime.

Obſervations on the diſorders in which the human bones become brittle or flexible.

Obſervations on coral and the elixated aſhes of vegetables, and on the earth depoſited in the putrefaction of vegetables; and particularly on the compoſition of theſe ſubſtances, and on the uſes of them in agriculture, metallurgy and other arts.

Obſervations on the earth called magneſia, and the reaſons for claſſing it with calcareous earths, although the art of burning, or otherwiſe turning it to lime, or the art of turning lime into magneſia, is not yet known.

The proceſſes for obtaining magneſia from mineral waters, and the bittern of ſea-water and of nitre beds.

The proceſs for making the fineſt mild magneſia from Epſom ſalt, or ſal catharticus amarus; and experiments ſhewing the relation of magneſia earth to the acidulous gas, and that more than two thirds of the weight and bulk of mild magneſia is made by the acidulous gas, with a little water and volatile alkali.

Inductions from theſe obſervations illuſtrating or confirming many of the foregoing notions of the author, relating to the properties of matter; and enumeration of the phænomena hitherto obſerved in the courſe, ſhewing the reaſons why effects are produced naturally in divers inſtances in the lapſe of time, which no human art can accompliſh.

The proceſſes for obtaining magneſia void of acidulous gas, commonly called calcined magneſia; and experiments ſhewing the tranſlation of this gas from mild magneſia to other bodies, and from other bodies to calcined magneſia; with obſervations on the effects of the compoſition of attractive forces in divers inſtances, and on the phænomena of theſe proceſſes.

Experiments ſhewing the combination of magneſia with vitriolic acid, and the formation of ſal catharticus amarus.

Obſervations on the phænomena, and on the means of diſcovering any other calcareous earth in adulterated magneſia.

Obſervations on the chemical properties and the medicinal and other uſes of ſal catharticus amarus, and on the choice of ſalts ſold under this name.

Experiments ſhewing the combination of magneſia with marine acid, and with acetous acid, and with phoſphoric acid; and the effect of magneſia and tartar on each other; with obſervations on the phænomena of theſe experiments, and on the products called marine ſalt, nitrous ſalt, acetous ſalt, phoſphoric ſalt, and tartareous ſalts, of magneſia.

Experiments ſhewing divers decompoſitions of the ſeveral ſalts of magneſia; with obſervations on the phænomenon called miraculum chemicum, and on the other phænomena.

Experiments ſhewing the effect of violent ignition on magneſia; the vitrification of magneſia by borax or ſedative ſalt, or by fuſible ſalt of urine, or by phoſphoric acid; alſo the effects of fixed alkalies, and of Sandiver, and of calx of lead on magneſia ignited ſtrongly; with obſervations on the phænomena.

Obſervations on the medicinal uſes of mild magneſia, and of magneſia diveſted of the acidulous gas.

Specimens of calcareous brecchiæ and lumacelli; on morbid calcareous concretions of animals, and on calcareous ſtones impregnated with metallic matter; with obſervations on theſe.

Enumeration of all the foregoing phænomena which indicate a polarity in the ſmalleſt natural parts of every kind of matter.

General obſervations on the phoſphoreſcent quality of calcareous bodies; and on the art of preparing lucid phoſphori from all the foregoing animal, vegetable and mineral calcareous ſubſtances; and of preparing any of theſe to exhibit any priſmatic colour of its phoſphoric illumination.

Inductions from the foregoing obſervations; and the reaſons why many ſtones conſiſting chiefly of calcareous earth do not make lime, and why the lime made of others, will not make good mortar; and why ſome calcareous ſtones ſoon moulder in buildings, whilſt others, ſuch as grey lime-ſtone and Portland ſtone, endure the weather a long time.

The methods of diſcovering the beſt kind of lime, whether of mineral or animal ſubſtances, for architecture and divers other purpoſes.

Obſervations on the uſe of lime in agriculture and in divers other arts.

General obſervations on the medicinal uſes of lime water, aqua calcis minus compoſita, aqua calcis magis compoſita; of chalk, oſteocolla, oyſter ſhells, crabs claws, crabs eyes, coral, pearl, calcined hartſhorn, calcareous bezoar, and other ſubſtances commonly called abſorbent earths; and on the *decoctum cretaceum*, *decoctum album*, *decoctum album compoſitum*, *julepum-reta*, *pulvis-helis cancrorum compoſitus*, *pulvis teſtaceus compoſitus*, *pulvis bezoar dicus*, or Gaſcogne's powder, *pulvis contraryervæ compoſitus*, *pulvis teſtaceus ceratus*, *pulvis e ſcammonio compoſitus*, *tabellæ cardialgicæ*, and other compounds containing abſorbent earth.

Strictures on the preſcription of lime water, and of water impregnated with the acidulous gas commonly called fixable air, with the view of diſſolving the human calculus.

Obſervations on the calcareous incruſtation which diſcolours the human teeth, and is called tartar of the teeth; and ſtrictures on the tinctures commonly ſold for the purpoſe of whitening the teeth.

SECTION XII.

Siliceous Earth.

SPECIMENS of the leaſt compounded ſiliceous bodies, with general obſervations, and the technical diſtinctions.

Experiments ſhewing divers properties and diſtinguiſhing characters of the earthy ſubſtances of the ſiliceous kind.

Chemical and technical obſervations on diamonds, jargoons, rubies, ſapphires, topazes, emeralds and other precious ſtones.

Chemical and technical obſervations on quartoſe ſtones cryſtals and ſands.

Experiments ſhewing divers properties of the purer quartoſe bodies.

Experiments ſhewing the vitrification of theſe bodies by different fluxes, with obſervations on the different vitreſcent powers of different fluxes; on the art of preparing fritts; on the different qualities of glaſſes made with different fluxes; on the art of manufacturing ſtras and glaſs; and on the improvements to be made in the formation of glaſs for achromatic inſtruments.

Obſervations on the art of rendering tranſparent glaſs, white and opaque; and on the manufactory and properties of Reaumur's porcelain.

Experiments ſhewing the ſolution of quartoſe ſtones or ſand, in water, by means of alkali, forming liquor of quartz and jelly of quartz; and ſhewing the quartoſe matter recovered from the alkali, and called precipitate of quartz, or diſſolved in acids forming gelatinous maſſes or ſalts of quartz.

Experiments ſhewing the formation of ſolid tranſparent ſtony aggregates from the liquor of quartz.

Inductions relative to the attraction of aggregation, elective attractions, the operation of menſtrua, the formation of hard ſtones, and the polarity of matter.

Obſervations on divers other properties of quartoſe ſtones, ſhingle and ſand, and the uſes of them in divers arts.

Specimens of the coloured and impure quartoſe ſtones and ſand, with chemical and technical obſervations on them.

The choice of ſand for ſand-baths, with the management of theſe.

Specimens of the ſiliceous bodies called flints, chert, plumb-pudding ſtones, opals, onyxes, chalcedony, carnelians, ſardonyx, agates and jaſper; with chemical and technical obſervations on them.

The proceſs for calcining flints and preparing flint-powder, with obſervations on the phænomena, and on the manufactories of flint-powder.

Experiments ſhewing the action of the ſaline and other bodies which are the beſt fluxes of flint; the different kinds of glaſs formed with theſe, and the properties of the glaſſes; the liquor of flints; the jelly of flints; divers ſaline and gelatinous precipitates containing ſilicious matter; and divers properties of ſilicious bodies.

Obſervations on the phænomena of theſe experiments, and the uſes of ſiliceous ſtones, and of flint-powder, in divers arts.

Obſervations on the cauſes of the opacity, the colour and the decay obſervable in glaſs long expoſed to the weather; and on other phenomena of glaſs.

The reaſon why the name of vitrifiable earth has been given to the ſiliceous tribe, and why this diſtinction is now rejected.

Experiments more clearly exhibiting the manner in which ſiliceous ſtones are formed; and obſervations on ſiliceous petrefactions, artificial hones, and powders and ſtones for poliſhing whetting and grinding.

Obſervations on granites and other ſtones which conſiſt chiefly of ſiliceous matter; and the reaſons why they

they are the beſt for building, paving and divers other purpoſes.

Experiments ſhewing the effect of ſiliceous ſtones and of calcareous bodies, ſuch as lime, bone-aſh gypſum and magneſia, on each other, in the fire; and the effects of theſe calcareous bodies on fritts and glaſſes conſiſting chiefly of ſiliceous matter, when theſe are melted together.

Specimens of the compounded ſiliceous ſtones which are conſiderably impregnated with metallic matter; and particularly of the garnets and cockle or ſhirl, or baſaltes, which conſtitute Cronſtedt's third order of earths; with obſervations on them.

Experiments ſhewing the fuſibility and other properties which diſtinguiſh garnets and cockle from the purer ſiliceous ſtones.

Enumeration of the active ingredients commonly uſed in dentifrices, with ſtrictures on the uſe and abuſe of dentifrices.

SECTION XIII.

ARGILLACEOUS EARTH.

SPECIMENS of the leaſt compounded argillaceous bodies, with general obſervations on them, and particularly on porcelain clay or kaolin, fat pipe clay, coloured fat clays which burn white, indurated clays called French chalk and ſoap earth, ſolid argillaceous bodies called ſteatites ſoap rock and ſerpentine ſtone.

Specimens of native compounds conſiſting chiefly of argillaceous earth, with obſervations on them; and particularly on the coloured and metallic fine clays, pencilſtone,

ſtone and coloured ſteatites, brick clays, boles, alum ſtones, marles, ſtone marrow or Fuller's earth, Tripoli and rotten-ſtone.

Theory of the action of marles, in agriculture, and of the different properties of different marles; and of the action of Fuller's earth, and of Tripoli and rotten-ſtone, in certain arts.

Experiments ſhewing the effect of ignition on argillaceous bodies; and on mixtures of theſe with alkalis, with acids, with borax, with ſandiver, with ſea ſalt, with calcareous earth, with flint powder or ſiliceous matter, and with metallic ſulphureous and other bodies which promote the vitrification of argillaceous earth; and obſervations on the glaſſes and ſemivitreous products of theſe proceſſes.

Experiments ſhewing other properties of argillaceous bodies and the principles of divers arts in which theſe bodies are chiefly uſed.

Obſervations on the materials, manufacture, technical diſtinctions, and properties of Chineſe porcelain, Dreſden, Briſtol, and other true porcelains of the Europeans; of the fine white or coloured ſtone wares, and the other wares in gradation to the worſt and vileſt made of clay.

Obſervations on the manufactures of artificial ſtone and the different kinds of bricks and tiles uſed in building or paving, and on the choice of them for theſe purpoſes.

Inſtructions for the choice and uſe of fire-bricks and cements for furnaces or coating or luting; and for the manufacture and choice of glaſs pots, crucibles, retorts, and other veſſels which are to ſtand intenſe fire, or the united action of fire and fluxes, or are intended to bear heating and cooling frequently, without fiſſure; with illuſtrative experiments made with Windſor loam, Sturbridge clay, and pipe clay; and with mixtures of theſe and baked clay, flint powder, ſand, moor-ſtone, black-lead and other ſubſtances, moiſtened with oil or water.

Experiments ſhewing the compoſition and properties of fritt porcelains; with obſervations on theſe.

Obſervations on the compoſitions which in baking retain the ſharpneſs of impreſſions, and become as hard as flint.

Inſtances of the application of this knowledge of earths in philoſophical and technical chemiſtry, and of ſome improvements made in this department by the author.

Obſervations on plume alum and aluminious efflorefcences; and on the phænomena occurring in the manufacture of alum, from alum ſtones compoſed chiefly of argillaceous earth and ſulphur; and on the diſtinctions of Roman alum and Engliſh alum.

Experiments ſhewing the ſolution of argillaceous earth in vitriolic acid, and the art of cryſtalizing alum.

Divers proceſſes for making the black pyrophorus of Homberg and other pyrophori; with obſervations on the phænomena, and on the ſulphur and elaſtic fluids detached or formed in theſe proceſſes.

The ſlow decompoſition of theſe pyrophori without heating; the quick accenſion and combuſtion of them by expoſure to air only, or to nitrous vapour or acid; the eſcape of volatile vit. acid and phlogiſton during the combuſtion of pyrophori; the encreaſed weight of the reſiduary matter; the phlogiſtication of the air contiguous to pyrophori; and divers other phænomena of pyrophori exhibited and explained, according to the author's premiſed notions of the different properties of different kinds of matter, and particularly of Light phlogiſton and air.

Experiments ſhewing divers decompoſitions of alum; and obſervations on the phænomena and the products; and particularly burnt or calcined alum vitrified without addition; the fine white earth of alum; and the tranſparent artificial ſtone formed by the ſlow aggregation of argillaceous particles, in water.

Obſervations on the uſe of alum in medicine, and on the ſerum alumino ſum, pulvis ſtypticus, aqua aluminoſa, coagulum aluminoſum, alumen uſtum, and the pharmaceutical compounds which contain alum: and ſpeculations concerning the agency of aſtringents in the human ſyſtem.

Obſervations on the uſes of alum in divers arts, and on the fining of ſpirituous and other liquors.

Obſervations on the reputed inſolubility of native argillaceous bodies in nitrous marine acetous and other acids, and on the cauſes thereof; and experiments ſhewing the methods of effecting the ſolution of argillaceous earth in theſe acids, and of preparing the nitrous, marine and acetous ſalts of argillaceous earth; with obſervations on the phænomena, and inductions relative to aggregation and divers notions of the author.

Specimens of argillaceous and calcareous oſteocolla, with obſervations on them.

Obſervations on the uſes and abuſes of ſealed earths, boles, Iriſh ſlate, Fuller's earth and oſteocolla in medicinal practice.

Miſcellaneous obſervations on the uſe of clays in divers arts, beſides thoſe already mentioned.

Obſervations on the melioration of clayey ſoils by ſhingle ſand or rubbiſh.

Obſervations on terras, and on its uſe in water fences; and on the ſubſtances which anſwer the ſame ends; and on the effect of terras, boles and clays, accidentally or intentionally mixed in mortar for building.

Inductions from the foregoing experiments and obſervations, confirming divers philoſophical notions formerly expreſſed in the courſe.

Specimens of divers ſubſtances which may be conſidered as argillaceous, altho' differing from the foregoing; with obſervations on them, and the cauſes of theſe differences.

Specimens of Muſcovy glaſs glimmer or coloured mica, and the talcy or micaceous bodies which conſtitute the fifth order of Cronſtedt; with obſervations on the technical diſtinctions of them.

Experiments ſhewing the effect of ignition on theſe, and on native and artificial mixtures of talcs with the ſeveral ſubſtances called fluxes, and with the foregoing earthy bodies.

Obſervations on the phænomena of theſe experiments, and on the glaſſes thus formed, and on the uſe of micaceous matter mixed with fine clay in making porcelain and the beſt pottery for chemical uſe.

Obſervations on pot ſtone and the Devonſhire moorſtone, and the improvements which are much wanted, and might eaſily be made in the Engliſh cheap pottery wares.

Experiments and obſervations which have induced the author to conſider theſe micaceous or talcy bodies, as argillaceous earth indurated; or as bodies conſiſting chiefly of argillaceous earth.

Specimens of the bodies of the aſbeſtus kind; which conſtitute the ſeventh order of Cronſtedt; with obſervations on the technical diſtinctions of them; and particularly on mountain leather, mountain cork, earth flax, and on the incombuſtible webs or paper made of byſſus; and on the uſe of amianthus in lamps.

Experiments ſhewing the chemical properties of aſbeſtine bodies, and the reaſons for our conſidering them as argillaceous ſubſtances, differing from thoſe heretofore mentioned, chiefly by reaſon of their different aggregation.

Specimens of the bodies which conſtitute the eighth order of Cronſtedt, called Zeolites.

Experiments ſhewing the phoſphoreſcence of heated zeolites.

Experiments ſhewing the chemical properties of zeolites, with obſervations on the preparation of ultramarine from lapis lazuli.

The author's reaſons for conſidering the ſubſtances called zeolites, in this order, and as conſiſting chiefly of argillaceous earth, but differing from the purer argillaceous ſtones, by compoſition and aggregation.

Specimens of mixed earths and ſtones, and particularly of brecchiæ, lumachella, ſand ſtones, mill-ſtones, flag-ſand, terras, lava, Iceland agate and volcanic flags, garden mould, mud, foſſile ſea coal, foſſile wood, jet, aſphaltum; and of divers other compound mineral ſubſtances, containing earthy matter chiefly unmetallic; with obſervations on their chemical properties and technical uſes.

Specimens of the mineral ſubſtances called manganeſe, which form the ninth order of Cronſtedt; with technical obſervations on them.

Experiments ſhewing the effects of acids on manganeſe, and the properties of the ſaline compounds formed by acids with the ſoluble part of manganeſe.

The proceſſes for combining manganeſe, by fuſion, with the fixed vegetable alkali; with mineral alkali; and with the alkaline baſis of nitre decompoſed by manganeſe.

Obſervations on the phænomena and products of theſe proceſſes.

Experiments ſhewing the colour, and changes of colour, produced in water, by the ſolution of the foregoing alkaline flags in water; with obſervations on the precipitates formed in different circumſtances, and on the various phænomena of theſe experiments; and general inductions.

Experiments ſhewing the ſlags and glaſſes, and enamels, and artificial jewels, and mock opals, and the colours produced in the vitrification of manganeſe, in different quantities, with divers frits and fluxes; and the means of diveſting theſe of their colour; and the effect of manganeſe in the glaſs-makers art, and in glazing pottery.

Enumeration of the demonſtrated properties of manganeſe, and of the phænomena of a great number of experiments made by the author, in his former courſes; and new experiments, with a view to ſhew whether manganeſe ought to be claſſed with the unmetallic earths, or ought to be conſidered as an ore of a ſemi-metal; or whether all the phænomena hitherto preſented by manganeſe, may be explained on this ground of its metallic nature, independent of any iron or tin which it generally contains.

The author's reaſons for not yet attempting to give manganeſe a place among the ores or metallic bodies.

SECTION XIV.

THE author's reaſons for treating of metals and metallic bodies in the following order, in preference to any other obſerved by teachers in chemiſtry.

ARSENIC.

Specimens of native arſenical regule, native arſenical calces and cryſtals, yellow arſenic or orpiments, native realgar or ſandarach, miſpickel, arſenical pyrites, and ores containing arſenic in conſiderable quantity; with obſervations on them.

The proceſſes for obtaining regule of arſenic from the ores which contain arſenic mineralized, or arſenic calciform;

ciform; with general obſervations on ſublimations and ſublimates of phlogiſtic bodies, and on polarity.

Experiments ſhewing the combuſtibility, volatility, the metallic, and divers other properties of regulus of arſenic.

Experiments ſhewing the combuſtion and dephlogiſtication of arſenical regule, to produce grey calx of arſenic, and white arſenic; with obſervations and inductions relative to phlogiſton, and fire, and the proceſs of combuſtion.

Obſervations on the manufacture of white arſenic in the zaffre manufactories.

The proceſſes for purifying the white arſenic of the ſhops, and producing white flowers and ſingular cryſtals of white arſenic by ſublimations; and for exhibiting divers intereſting phænomena obſerved by the author, and illuſtrative of ſome of his notions.

Experiments ſhewing the ſolubility and cryſtalization of white arſenic in water, the fuſion of it in cloſe veſſels, the volatility and divers other properties of it.

The author's proceſs for reviving calx of arſenic, and obtaining pure regule of arſenic in the cheapeſt and moſt expeditious manner; with obſervations on the phænomena; and eſpecially on the elaſtic fluids detached in this proceſs.

Obſervations on the proceſſes directed by other chemiſts, for obtaining regule of arſenic.

Experiments ſhewing the effects of phlogiſton combined with calx of arſenic, and the changes produced in the bodies from which phlogiſton is transferred to arſenical calx; and other experiments ſhewing divers properties of phlogiſton, and that phlogiſton and fire, or light, are not the ſame kind of matter; but that phlogiſton differs from concentrated light or fire, as much as any two of the author's elements differ from each other.

Obſervations on the ſmell taſte and poiſonous qualities of white arſenic and arſenical vapours; and on the effects of white arſenic, and of regulus of arſenic, adminiſtered in ſmall quantities as medicines, or externally applied in ſurgical caſes; and on the uſes of white arſenic and regulus of arſenic in arts.

The proceſs for uniting calx of arſenic or white arſenic with vitriolic acid, and forming alum of arſenic; with obſervations on the fixity and other properties of this arſenical compound, on the elaſtic fluid detached in this proceſs, and on divers phænomena of it.

Experiments ſhewing the effects of white arſenic, and the author's colourleſs concentrated nitrous acid on each other.

The proceſſes for combining white arſenic with marine acid, and preparing the arſenicated ſmoaking ſpirit, arſenicated elaſtic fluid, and butter of arſenic; with obſervations on theſe compounds, and on the phænomena which they preſent in divers experiments of the author.

Proceſſes diſcovered by the author, for impregnating vitriolic and marine acid, and concentrating them in ſuch a manner that they ſhall not blend permanently, although they be perfectly liquid.

Obſervations on the proceſſes for ſhewing the relations of arſenical calx and other acids beſides thoſe mentioned above, towards each other.

The proceſs for decompoſing nitre by calx of arſenic, and combining the arſenic with fixed vegetable alkali, and forming the ſaline compound called neutral arſenical ſalt in cryſtals of the figure deſcribed by the chemiſts, and in cryſtals of uncommon and curious figure and arrangement.

Experiments ſhewing the nitrous gas of the foregoing proceſs received in water, and colouring the water blue green and yellow ſucceſſively; and ſhewing divers other curious phænomena reſulting from the action of the condenſed phlogiſticated acid and water on each other.

Experiments ſhewing the properties of the water thus impregnated; with the author's explanation, according to general and eſtabliſhed principles, of the mantling of this liquor and the eſcape of an elaſtic fluid from it, and on other phænomena attending the agitation of it; and his explanation of the eſcape of nitrous gas from theſe liquors, and their changes and loſs of colour, on expoſing them in open or ill ſtopped veſſels.

Experiments exhibiting the like phænomena, in the manner of Stahl, with pirmieſon or lapis de tribus; and the like preparation of blue ſpirit of nitre, and green ſpirit of nitre; with obſervations on other curious phænomena of this proceſs.

Obſervations on the works of ancient authors, and on thoſe of later writers, who noticed the foregoing effects of phlogiſticated nitrous vapour, and of nitrous gas, in a multitude of experiments.

Obſervations on ſimilar proceſſes publicly exhibited by the author in each of his courſes during five years, with nitrous acid variouſly phlogiſticated: and ſtrictures on the pretences lately made to the original diſcovery of theſe phænomena.

Experiments ſhewing the properties of neutral arſenical ſalt; with obſervations on the uſe of it, in the compoſition of glaſſes, paſtes, enamels, and as a flux in ſcorifications, and as a teſt of certain impregnations of water; and on other uſes of it in arts, eſpecially in dying, metallurgy, and technical chemiſtry.

Obſervations on the effects of neutral arſenical ſalt adminiſtered as a medicine.

Experiments ſhewing divers inſtances of compoſitions and decompoſitions effected by compound attractions.

The proceſs for making nitre fixed by arſenic, with obſervations on the phænomena, and on the erroneous compariſons made between this ſubſtance and the neutral arſenical ſalt; and experiments of the author, ſhewing the particulars in which theſe do differ; and the circumſtances in which neutral arſenical ſalt or nitre fixed by arſenic may be made with the ſame materials, in open veſſels.

The proceſs for preparing liver of arſenic in the uſual manner.

The author's proceſs for preparing liver of arſenic; with obſervations on this combination, and on the compariſons uſually made between the common liver of arſenic and neutral arſenical ſalt; and on the perplexities in which this ſubject has been hitherto unneceſſarily involved.

The proceſſes for preparing mineral alkaline liver of arſenic, and arſenical ammoniacal ſalt, with obſervations on theſe.

Divers inſtances of combination and decompoſition by compound attractions contrary to the direct order of ſimple attractions.

The proceſſes for combining calx of arſenic or white arſenic with ſulphur, in different proportions; and for forming artificial pale, yellow, and orange-coloured orpiments, and the red orpiment called artificial realgar, or red rizigal, and ruby of arſenic.

Obſervations on the effects of orpiments adminiſtered as medicines, or externally applied; and on the efficacy of ſulphur, in rendering arſenic, as well as other very active or poiſonous ſubſtances, innocent or inactive, in proportion to the quantity of ſulphur combined with them.

Obſervations on the uſes of orpiment in arts; and on the electric property of the liver-coloured tough orpiment of the author.

The proceſſes for making calcareous liver of orpiment, and other livers of orpiment; with obſervations on the beſt methods of applying them to take off hair; and on the action and uſe and abuſe of depilatories.

Experiments ſhewing divers other relations and properties of orpiments.

Proceſſes for decompoſing orpiment and recovering the white arſenic and the ſulphur of it apart; with obſervations on theſe proceſſes, and on ſublimations in general, and on the polarity of matter.

Proceſſes for diſſolving white arſenic in oils, with obſervations on the products.

Experiments ſhewing the methods of applying arſenic to facilitate the vitrification of unmetallic earths, and to enter into the compoſition of glaſſes, to make them colourleſs, or ſemi-opaque and white, or to make the Engliſh white enamel; with obſervations on the qualities of arſenicated glaſſes.

Inductions from the phænomena of arſenical bodies, confirming divers notions of the author.

Reflexions on the foregoing phænomena, and other phænomena of arſenic in combination with acids, and ſeemingly repugnant to the received order of attractions; and conjectures concerning the conſtituent matter of white arſenic, and the peculiar capacity of it to combine more or leſs intimately with all known bodies (Gellert's exception being diſregarded) whereby ſome chemiſts have been induced to conſider it as an acid, others as a ſemi-metal, and others as a ſubſtance ſui generis, reducible to no order, in the preſent ſtate of our knowledge.

Experiments to be made, if the circumſtances of the courſe will admit of them, with a view to the advancement of our knowledge of this ſingular ſubſtance, and to the explanation of divers phænomena of arſenic and metallic ſolutions and allays, to be hereafter ſhewn.

SECTION XV.

COBALT.

SPECIMENS of the mineralized ores of cobalt, the ochres and calciform ores of cobalt, and the improper ores of cobalt; with obſervations on them.

The proceſſes for preparing, calcining and aſſaying different kinds of cobalt ore, to obtain the ſemi-metal called regulus of cobalt in the pureſt ſtate and at the ſmalleſt expence.

The rationale of theſe proceſſes with obſervations on the phænomena and products.

Metallurgic principles for the working of cobalt regule, in the great, illuſtrated by experiments.

Experiments ſhewing the action of fire on regulus of cobalt, and divers diſtinguiſhing characters of it.

The proceſſes for calcining regulus of cobalt by the joint action of air and fire, or by nitre; with obſervations on the phænomena and products, and particularly on thoſe which ſhew the nature of phlogiſton and air.

The proceſſes for impregnating ſtras and other vitreous compoſitions, with the calx of regulus of cobalt, or with pure calciform ores of cobalt, or calcined ore of cobalt called zaffre; to make blue glaſſes and falſe ſapphires, and blue and black enamels; with obſervations on theſe, and on the preparations of blue pigments and ſmalts called powder-blue, from the glaſſes of cobalt.

Obſervations on the different colours induced by cobalt in glaſſes made with different fluxes.

The proceſs for diſſolving regulus of cobalt in vitriolic acid and forming the vitriol of cobalt; with obſervations on the elaſtic fluid detached in this proceſs, and on the properties of vitriol of cobalt.

The proceſs for diſſolving regulus of cobalt in nitrous acid and forming the nitre of cobalt; with obſervations on the properties of nitre of cobalt.

Experiments ſhewing the changes of colour which happen to the nitrous ſolution of cobalt in certain circumſtances, and the uſe of this ſolution as a ſympathetic ink.

The proceſſes for diſſolving cobalt in marine acid and forming the marine ſalt of cobalt, with obſervations on the phænomena and products.

Obſervations on the tranſlations of phlogiſton from the regulus of cobalt, during the ſolution of it in acids; and on the ſtate of its metallic earth in cobaltic ſalts.

The proceſſes for preparing the ſympathetic ink of cobalt; the writing with which becomes legible, with a blue colour, on being heated, and vaniſhes on cooling.

Obſervations on other ſalts of cobalt, and on the proceſſes for decompoſing ſalts of cobalt, and on the elective attractions of cobalt.

The proceſſes for combining cobalt with fixed or volatile alkalies, to make alkaline ſolutions of cobalt; with obſervations on the phænomena, and on the aggregation of bodies.

The proceſs for making the blue calx of cobalt, in the manner of Pruſſian blue.

Experiments ſhewing the relations of cobalt to divers other bodies treated of in former parts of the courſe.

Obſervations on the allay of cobalt regule, with reg. of arſenic; and on divers erroneous notions of chemical wrirers, concerning the regulus of cobalt.

SECTION XVI.

NICKEL.

SPECIMENS of mineralized ores of nickel called kupfer nickel, the ochres or calciform ores of nickel, and the improper ores: with obſervations on them.

The proceſſes for waſhing, calcining and aſſaying different kinds of nickel ore, to obtain the ſemimetal called nickel, in the pureſt ſtate and at the ſmalleſt expence.

The rationale of theſe proceſſes, with obſervations on the phænomena.

The proceſs for procuring flowers of nickel; with obſervations and general inductions.

Metallurgic principles for the working of nickel in the great, illuſtrated by experiments.

Experiments ſhewing the action of fire on nickel, and divers diſtinguiſhing characters of this ſemi-metal.

The proceſſes for calcining nickel; with obſervations on the phænomena, and on the calces of nickel by fire or nitre; and general obſervations relative to calcination, combuſtion, attraction, and to light, phlogiſton and air.

The proceſſes for impregnating vitreous compoſitions with the calx of Nickel, to make glaſſes, falſe jewels and enamels of divers colours, and particularly the permanently crimſon coloured paſte of the author.

The proceſſes for forming ſalts with nickel and the mineral acids; with obſervations on the phænomena and products.

The proceſſes for obtaining the colcothar of nickel and green and other coloured calces of nickel, from theſe ſalts, with obſervations on the phænomena.

Proceſſes for combining nickel with fixed or volatile alkalies, and forming blue ſolutions of nickel, and calces of nickel of different colours, and particularly the purple and blue calces.

Experiments ſhewing the action of ſulphur on nickel, and the properties of the matt of nickel.

Experiments ſhewing the action of liver of ſulphur on nickel; with obſervations relative to the aſſay and metallurgy of nickel ores.

Experiments ſhewing the allays of nickel with regulus of arſenic, and of nickel with regulus of cobalt, and of theſe three with each other; with obervations of the author relative to the Britiſh cobalt ores and the metallurgy of nickel.

SECTION XVII.

BISMUTH.

SPECIMENS of native biſmuth and of the mineralized and calciform ores of biſmuth, with obſervations on them.

The proceſſes for obtaining biſmuth by eliquation from the mineralized and rich ores. And for aſſaying the different Biſmuth ores; and for extracting biſmuth from the ores in the manner of the great works; with the rationale of theſe proceſſes, and obſervations on the phænomena.

The cautions and metallurgic principles to be obſerved in the working of biſmuth in the great, illuſtrated by experiments.

Experiments ſhewing the action of fire on biſmuth, the formation of flowers of biſmuth, and the phænomena of biſmuth in ſetting, and divers diſtinguiſhing characters of this ſemi-metal.

The proceſſes for dephlogiſticating or calcining biſmuth, and preparing calces of biſmuth, and the glaſs of biſmuth; with obſervations generalizing many of the inductions heretofore made, concerning attraction, combuſtion, and light phlogiſton and air.

Experiments ſhewing the preciſe encreaſe of weight of biſmuth in calcination; with the cauſes thereof.

Experiments ſhewing the vitreſcent powers of calx of biſmuth, and glaſs of biſmuth; and the glaſſes made with ſiliceous and other earthy bodies, vitrified by means of the calx of biſmuth, and of this and other fluxes; with obſervations on the phænomena, and inductions relative to the author's notions of colour.

Obſervations of the author on the uſe of biſmuth calx in forming glaſſes poſſeſſing the greateſt refractive powers, and on the means of making the beſt achromatic glaſſes, with certainty.

The proceſſes for reducing the calces of biſmuth; and experiments in order to ſhew what truly happens to metallic bodies in the calcination and in the reduction of them; and to ſhew that phlogiſton is a kind of matter totally different from that of fire or light.

The proceſs for making the vitriol of biſmuth; with obſervations on the elaſtic fluid, the ſulphureous acid and the ſulphur obtained in this proceſs; and on certain properties of the vitriol of biſmuth, diſcovered by the author, and generalizing inductions formerly made.

The proceſs for making nitre of biſmuth; with obſervations on the phænomena; on the properties of nitre of biſmuth; and on the elaſtic fluids obtainable from this ſalt, or from the calx of it moiſtened with nitrous acid.

Divers proceſſes for decompoſing nitre of biſmuth; with obſervations on the phænomena, and products, and particularly on the calces of biſmuth obtained in theſe proceſſes.

The beſt proceſs for making the magiſtery of biſmuth uſed as a coſmetic under the name of pearl powder, and in divers coſmetics waſhes of various denominations; with obſervations on coſmetics of this kind, and on coſmetics in general.

General obſervations on the decompoſition of metallic ſalts by water.

Proceſſes for combining biſmuth with marine acid, and making corneous biſmuth or marine ſalt of biſmuth; with obſervations.

Experiments to ſhew the effect of other acids on biſmuth and calces of biſmuth; with obſervations.

Experiments ſhewing the changes of colour which ſolutions and ſalt and white calces of biſmuth undergo in the open air, and by expoſure to the ſun, and eſpecially by expoſure to phlogiſtic vapours; and ſhewing divers phænomena of phlogiſton.

Philoſophical and technical obſervations generalizing divers inductions of the author.

Proceſſes for combining biſmuth with fixed and volatile alkalis, with obſervations.

Experiments ſhewing the decompoſition of ſal ammoniac by calx of biſmuth ignited, and the ſublimation of biſmuthic flowers of ſal ammoniac; with obſervations.

Experiments of the author ſhewing the action of biſmuth and nitre on each other in different ſtates of ignition, and divers ſingular phænomena.

Decompoſitions of ſaline compounds of biſmuth, affording calces of biſmuth variouſly coloured, and new combinations.

Obſervations on the phænomena of theſe proceſſes, generalizing doctrines formerly delivered.

Experiments ſhewing the action of ſulphur and biſmuth on each other, and the properties of biſmuth matt.

Experiments ſhewing the action of liver of ſulphur on biſmuth, with obſervations relative to the metallurgy of biſmuth.

Exderiments ſhewing the action of oils on calces of biſmuth.

Attempts to allay biſmuth with regulus of arſenic.

Experiments ſhewing how far biſmuth may be allayed with cobalt regule, and the proportions beyond which they do not allay, but ſeem to ſeparate from each other in fuſion.

Experiments ſhewing the allay of biſmuth with nickel.

Experiments ſhewing the allays conſiſting of biſmuth, nikel, cobalt and arſenic.

Experiments of the author ſhewing the analyſis of the metallic compound called ſpeiſs; and ſerving to correct the erroneous notions of divers chemiſts concerning this ſubject and cobalt and nickel and biſmuth.

Obſervations on the phænomena of theſe experiments, and advices concerning the metallurgy of ores containing biſmuth and cobalt, and ores containing theſe and other metallic matter.

Obſervations on the technical uſes of biſmuth.

SECTION XVIII.

ANTIMONY.

SPECIMENS of the foreign antimonial ores, and of the antimonial ores of Cornwal, with technical obſervations.

The proceſs for obtaining the matt of antimony commonly called antimony or crude antimony, from the mineralized ores; with chemical and medicinal obſervations.

The beſt proceſſes of the metallurgiſts for obtaining the regulus of antimony from the antimonial ores or crude antimony, in the way of aſſay, and as they are practiſed in the great works; with the rationale of theſe proceſſes, and obſervations on the phænomena.

The author's proceſs for obtaining pure regulus of antimony from the impure ores and crude antimony of Cornwall.

Obſervations on the jovial, venereal, ſaturnine, lunar and martial regules of antimony.

The art of procuring the regulus of antimony with the ſtar or ſtellated appearance, with obſervations.

The author's art of preparing the regulus of antimony in an uncommon ſtate of aggregation, and fitteſt for certain proceſſes.

The cautions and metallurgic principles to be obſerved in the working of antimony in the great, illuſtrated by experiments.

Specimens of perpetual pills and purgative cups; with obſervations on the medicinal and ſtriking effects of the ſmalleſt menſurable quantities of regulus of antimony.

Experiments ſhewing the action of fire on regulus of antimony, and divers diſtinguiſhing characters of this ſemi-metal.

The beſt proceſs for making argentine flowers of antimony; with obſervations on the phænomena, and on the proceſſes of chemiſts.

Experiments ſhewing the compoſition and properties of the argentine flowers of antimony, with obſervations on the medicinal effects of them, and on the kinds of matter of which they conſiſt.

The proceſs for calcining regulus of antimony in the reverberatory furnace, and preparing the grey calces of antimony, and the whitiſh calces called reguline diaphoretic antimony, and reguline bezoar mineral. The proceſſes for making the reguline liver and reguline glaſs, and the opaque reguline ſlag of antimony; with obſervations on the phænomena of theſe proceſſes, and on the medicinal characters of the products.

Obſervations on the material differences between regulus of antimony, and the calces and glaſſes of it, and on divers phænomena of calcination.

Experiments ſhewing the effects of different calces of antimonial regule, in glaſſes compoſed of divers ſubſtances; with obſervations on the phænomena occurring in the formation of theſe glaſſes.

The proceſs for making the vitriol of antimony, with obſervations on the vitriol, the elaſtic fluid, the ſulphur, and ſulphureous acid of this proceſs; and inductions from theſe obſervations.

Experiments ſhewing the action of regulus of antimony and nitrous acid on each other; with obſervations on the white calx of antimony calcined by nitrous acid, and on the nitrous bezoar mineral prepared from this white calx, and on the nitrous gas and the nitrous phlogiſtic vapour formed in theſe experiments.

Obſervations on the antiquity and number of the proceſſes in which nitrous gas has been formed and obſerved, and ſtrictures on the modern pretences to the diſcovery of it.

The reaſons why common ſpirit of ſalt acts very weakly, or not at all, on regulus of antimony; with general inductions from the foregoing phænomena, concerning attractions, aggregation, and the tables of affinities.

Obſervations on the different proceſſes in which butter of antimony has been prepared, under different appellations.

The proceſſes for preparing the reguline butter of antimony, with obſervations on the phænomena.

The proceſs for preparing the butter of antimony in the uſual method, with obſervations on the phænomena, and on the differences between this butter of antimony and the reguline butter of antimony.

The proceſſes for rectifying and cryſtalizing butter of antimony, and for making a tranſparent and perfect ſolution of it in water.

Obſervations on the deliquiation of butter of antimony, in preparing the cauſticum antimoniale of the London College, with ſtrictures on the errors of this proceſs.

Obſervations on the cauſticity and the other properties of butter of antimony.

Obſervations generalizing the author's notions of volatility, fixity, attraction, ſaturation, &c.

Divers proceſſes for decompoſing butter of antimony; and the proceſs for preparing *mercurius vitæ* or powder of algaroth, and the liquor improperly called philoſophical ſpirit of vitriol; with obſervations on the phenomena, confirming the author's notions of ſimilar phenomena by which ſome pretend to ſhew the converſion of water into earth.

The proceſs for making the true bezoar mineral, with obſervations on the phenomena, and particularly on the elaſtic fluid detached in this proceſs, and on the compoſition, and the chemical and medicinal characters of bezoar mineral.

General inductions from theſe and ſimilar phænomena.

Experiments of chemical authors, ſhewing the action of regulus of antimony and aqua regia on each other.

Experiments of the author ſhewing the actual and vivid combuſtion of regulus of antimony by acid vapour, and other curious phænomena.

The explanation of theſe phænomena according to the author's notions of the elements of matter, and their properties, and his theory of combuſtion, illumination, and fire.

Experiments ſhewing the action of other acids, and acidulous or vinous liquors, and regulus of antimony on each other in divers circumſtances; with chemical and medicinal obſervations.

Experiments ſhewing the action of fixed and volatile alkalies and the regule and calces of antimony on each other in different circumſtances; with obſervations.

Experiments ſhewing the action of regulus of antimony and divers compound bodies not ſtrictly ſulphureous, or acid, or alkaline, on each other.

Experiments ſhewing the combuſtion and detonation of regulus of antimony with nitre, and the preparation of ceruſſe of antimony; with obſervations on the phænomena, on the calx of antimony thus obtained; on the cauſtic alkali of nitre alkalized, and the elaſtic fluid formed in this and ſimilar proceſſes.

The proceſſes for preparing clyſſi; and for ſhewing divers phænomena of detonations in cloſe veſſels, and the elaſtic fluids detached during theſe combuſtions.

General obſervations confirming the author's inductions concerning nitrous acid, combuſtion, detonation, and other ſubjects.

Divers decompoſitions of the foregoing antimonial compounds, with a view towards different ſubjects of philoſophical medicinal and technical chemiſtry.

The proceſſes for combining regulus of antimony with ſulphur, and re-producing antimonial matt or crude antimony; and the proceſſes for combining regulus of antimony with liver of ſulphur; with obſervations on the phænomena and products.

The proceſſes for ſubliming the grey, and yellow, and white flowers of crude antimony; with obſervations on the phænomena, and on the properties and medicinal uſes of theſe flowers.

The true proceſs for making the calciform antimonial ſublimate called Doctor James's powder; with the rationale thereof, and obſervations on the phænomena.

Obſervations on antimonial ores, and on divers antimonial medicines, and on the proceſs for making the calciform antimonial ſublimate called Doctor James's powder; all tending to ſhew the preference due to this latter as an antimonial medicine, in moſt caſes.

The beſt proceſs for calcining crude antimony, and for making the liver of crude antimony by fuſion per ſe, and the beſt glaſs of antimony for medicinal and other uſes; with obſervations on the phænomena, and on the medicinal effects of this liver and of the glaſs of antimony, and of theſe calces of crude antimony, compared with the crude antimony.

The preparation of the vinum antimoniale of the Edinburgh college, and of the vitrum ceratum antimonii; with obſervations.

The proceſſes for making *crocus antimonii medicinalis*, *panacea antimonii*, rubin of antimony or *magneſia opalina*, *regulus antimonii medicinalis*, *pulvis febrifugus Craanii*, *crocus antimonii mitior*, *crocus metallorum* or *crocus antimonii*, *crocus antimonii lotus*, & *emeticum mite antimonii*; with the rationale of theſe proceſſes, and obſervations on the phænomena, on the chemical properties of the products, and on the medicinal effects of theſe antimonials.

Obſervations on the preparation and properties of the antimonial wine of the London college.

The proceſſes for making ſpirituous tinctures of antimony, called antimonial drops.

The proceſſes for deſulphurating crude antimony, and precipitating a part of its regule, and for forming the ſaline ſcoriæ of regulus of antimony; with obſervations.

The beſt proceſſes for making ſulphur auratum antimonii, or ſulphur præcipatum antimonii, and the powder of Chartréux or kermes mineral; with the rationale of theſe proceſſes, and obſervations on the phænomena and various products of them.

Remarks on the preſcriptions of different chemiſts, and of the pharmacopœiæ, for preparing theſe medicines; and on the general cauſes of the controverſies concerning antimonial medicines; and on the proper methods by which theſe lately mentioned may be obtained of uniform appearance and efficacy.

Experiments in order to aſcertain the nature of the elaſtic fluid, which is detached during the precipitation of ſulphur auratum antimonii, and during ſimilar decompoſitions of ſulphureous bodies; with obſervations on the native ſulphureous mineral waters, and the artificial waters of this kind.

General obſervations on the effects of phlogiſtic gaſſes and of other phlogiſtic bodies, on the nerves.

The proceſſes for preparing calx antimonii nitrata, antimon. diaphoretic, illotum, or reſolvent of Rotrou, diaphoretic mineral or calx antimonii of the London college, the pearl-matter or ceruſſe of antimony called the fixed ſulphur of antimony, and nitrum ſtibiatum; with obſervations on the phænomena, and on the other products of theſe proceſſes.

Experiments of the author, ſhewing the nature and component principles of this calx of antimony: with remarks on theſe, and on the medicinal effects of calx of antimony; and on certain experimental enquiries which demand the attention of phyſicians.

Experiments ſhewing divers phænomena common to this white calx of antimony and other white metallic calces; with inductions.

The proceſs for making the pyrophorus of antimony, which, by the mere expoſure to air, fires and explodes; with Obſervations generalizing divers notions of the author.

Experiments ſhewing the action of tartar and antimonial calces and glaſſes on each other in different circumſtances.

The beſt proceſs for making ſtibiated tartar or tartar emetic, of uniform ſtrength and appearance; with obſervations on the phænomena, and on the erroneous proceſſes of the London and Edinburgh pharmacopœiæ for preparing tartar emetic.

Obſervations on the medicinal effecta tartar emetic, and on the erroneous notions entertained concerning this and other antimonials.

The proceſſes for decompoſing ſal ammoniac by antimony and ignition; and for preparing the red and yellow flowers of ſublimates of antimony, called volatile kermes; with chemical and medicinal obſervations.

Experiments ſhewing divers phenomena of calces, livers, and glaſſes of antimony, in vitrification with different fritts; with inductions relative to phlogiſton, colour, and other ſubjects.

The beſt proceſſes for reducing or reviving the foregoing flowers, calces, glaſſes, livers and ſalts of antimony.

Experiments ſhewing the allays of regulus of antimony with arſenic, cobalt, nickel and biſmuth, and of three or more of theſe with each other, with obſervations.

Obſervations on certain allays uſed under the name of ſpeculum metal.

Obſervations on the ſingular matt formed with crude antimony and regulus of nickel, with metallurgic inductions.

The proceſs for making the lapis pirmieſon, or lapis de tribus, or magnes arſenicalis; with obſervations.

Inductions from the foregoing phenomena, and from medical experience, concerning the cauſes of the very different effects produced by different antimonial preparations.

Cautions to be obſerved in preſcribing antimonial and other compound medicines of the metallic kind.

Summary obſervations on the errors and comparative merits of the London and Edinburgh pharmacopœiæ, in their antimonial preparations.

Obſervations on divers empyrical antimonial medicines exhibited in the form of tinctures, drops, pills, or powders, and named after the proprietors of them.

SECTION XIX.

ZINC.

SPECIMENS of Zinc ſpars, calamine ſtones and other caliform ores of zinc; and of the mineralized proper ores, and the blendes and improper ores of zinc; with obſervations on them.

The preparation of lapis calaminaris for medicinal uſe; with obſervations.

The proceſſes for obtaining zinc or ſpelter from the ores; the rationale of theſe proceſſes; and the metallurgic principles to be obſerved in working zinc; with obſervations on the phænomena of the zinc-houſes in Great-Britain.

Experiments ſhewing divers properties and diſtinguiſhing characters of zinc.

The proceſſes for ſubliming and purifying zinc.

The beſt proceſs for calcining or burning zinc, and for preparing the grey and the white calçes of zinc, and the fineſt flowers called nihil album or philoſophical wool, in the author's method.

Obſervations on the phænomena of theſe proceſſes; on the chemical properties and technical uſes of the products; and on the adminiſtration of zinc-flowers in medical practice.

Inductions from the foregoing phænomena, generalizing the author's notions of phlogiſton and fire, and of combuſtion and flame.

Obſervations on pompholyx, cadmia fornacum and tutty, and on the uſes to which they are applied in medicine.

Experiments ſhewing the extreme fixity of calx of zinc, in compariſon with the volatility of zinc: inductions concerning earthy matter, volatility, fixity, and refractory bodies.

Experiments ſhewing the effects of calx of zinc in vitreſcent compounds; and the glaſſes and enamels compoſed of calx of zinc and divers fritts and fluxes.

Experiments ſhewing the reduction of the calces and glaſſes of zinc, and divers phænomena which indicate the truth of the author's notions of phlogiſton and fire.

Experiments ſhewing the ſolution of zinc in diluted vitriolic acid, the formation of vitriol of zinc or white vitriol, the formation of inflammable gas, and other phænomena.

Experiments of the author ſhewing the ſolution of zinc in vitriolic acid, affording products and phenomena different from the foregoing, and tending to eſtabliſh his notions of the inflammable gas.

Obſervations on native capillary white vitriol; and on the effloreſcences of white vitriol from pyrites of zinc; and on the manufacture of white vitriol in the great works.

Experiments ſhewing divers properties of white vitriol.

Obſervations on the medicinal effects of white vitriol; on the collyria and opthalmic waters in which it is uſed; and on divers chemical and technical uſes of it.

Experiments of the author ſhewing that white vitriol contains a vaſt quantity of matter different from what it was heretofore ſuppoſed to conſiſt of: And obſervations on theſe and ſimilar experiments; with a view to the advancement of philoſophical and medicinal chemiſtry, and the explanation of divers phenomena which perplex the chemiſts.

The proceſſes for making the marine ſolution and ſalt of zinc, and butter of zinc; with obſervations on the inflammable gas and other products, and on divers phenomena of theſe proceſſes.

Experiments of the author ſhewing different elaſtic fluids obtainable in different circumſtances from nitrous acid and zinc; and the different ſaline products of different proceſſes with zinc and nitrous acid; with his explanation of the phenomena.

Experiments ſhewing the action of aqua regia on zinc, and the elaſtic fluids and other products of theſe bodies.

Experiments ſhewing the production of inflammable gas from acetous acid and zinc, and the formation of acetous flowers of zinc; and alſo ſhewing divers intereſting phenomena.

Enumeration of the phenomena heretofore ſhewn, relative to colour, and coloured flame and illumination, with inductions.

Obſervations on divers properties of acetous ſalt of zinc, and reaſons for introducing it in medicine.

Experiments ſhewing the action of the vitriolic, nitrous, marine, and acetous acids on the white flowers of zinc: with obſervations and inductions.

Experiments ſhewing the action of zinc and phoſphoric acid and other acidulous bodies on each other; and particularly the tranſlation of the phlogiſton of zinc to phoſphoric acid and the formation of true phoſphorus of Kunkel.

Experiments ſhewing the combinations of zinc with fixed and volatile alkalies; with obſervations on the phenomena.

Obſervations on the depoſitions and ſpontaneous changes of ſolutions and ſalts of zinc which have been long expoſed to the common air; and explanations of theſe phenomena according to the author's notions of acids and air.

Experiments ſhewing the brillant combuſtion and detonation of zinc with nitre; and nitre alkalized and cauſtic by zinc, alkaheſt of Riſpour, and the white calx of zinc by nitre; with obſervations.

Experiments of the author ſhewing the elaſtic fluids, and divers curious phenomena, of zinc detonated with nitre in cloſe veſſels, and of the ſaline and calciform reſidue of this proceſs; with obſervations and inductions.

Obſervations on aqua vitriolica, aqua vitriolica camphorata, aqua aluminoſa Bateana, ceratum epuloticum, unguentum é lapidec alaminari, unguentum tutiæ, unguentum diapompholygos; and on other collyria, ointments and pharmaceutical compounds, in which calamine tutty zinc flowers or ſalts of zinc are uſed.

Obſervations on the attempts made to combine zinc with ſulphur.

Obſervations on divers allays of zinc with regule of arſenic, cobalt, biſmuth and regulus of antimony; and particularly on the allays which ſwell conſiderably in ſetting; and on the errors of chemiſts concerning ſome of theſe allays, and concerning zinc which has undergone repeated fuſions.

SECTION XX.

TIN.

SPECIMENS of tin grains and tin ores, with obſervations on them.

The proceſſes for dreſſing and aſſaying tin ores, in the manner of the beſt artiſts in Cornwall.

Divers proceſſes in which the beſt metallurgy of tin-ore is exhibited, and the phenomena and products of the ſmelting houſes are ſhewn.

The rationale of theſe proceſſes, with obſervations on the phenomena.

The metallurgic principles to be obſerved in aſſaying tin-ores, and in ſmelting with mineral or vegetable fuel.

Obſervations on the ſlags and ſcoriæ of the tin-houſes, on block tin, and purified tin called grain-tin.

Experiments ſhewing divers diſtinguiſhing characters of tin, and the action of fire on this metal.

Obſervations on the art of making tin foil.

The proceſs for granulating tin.

The proceſs for making the ſtannum pulveratum of the London college; with obſervations on the medicinal uſes of this preparation and the means of adminiſtering it in large doſes, with ſafety.

Experiments ſhewing the ſuperficial and partial dephlogiſtication of tin, and the production of the priſmatic colours of it; with obſervations on the Nuremberg art of making coloured foils; and inductions concerning colour.

Experiments in order to exhibit ſimilar phenomena, with the foregoing ſemimetals and allays.

The beſt proceſſes for dephlogiſticating tin, and preparing the grey calx of tin called calx Jovis, and the whitiſh calx of tin called pure putty.

Strictures on the uſe of calx Jovis as an anthelmintic.

Obſervations on divers phenomena of the calcination of tin; and particularly on the viſible combuſtion of tin, and the extraordinary increaſe of its weight in the calcination.

Experimental inveſtigations of the cauſes of this increaſe.

Obſervations generalizing former inductions.

The proceſs for making the mixed calx which is uſually ſold under the name of putty; with obſervations.

Remarks on the uſe of putty and of divers other ſubſtances in poliſhing.

Experiments ſhewing the extreme fixity and refractorineſs of tin calx, and its effects in fritts and vitreous compoſitions; and the principles on which tin calx is uſed in making opaque glaſſes, white and coloured enamels, and imitations of precious ſtones.

Divers experiments ſhewing the effects of ſmall portions of phlogiſton on fuſed glaſſes containing tin calx; and ſhewing the ſtriking changes, which glaſſes and enamels containing tin calx, undergo by violent ignition.

The author's diſcovery of the art of making the Venetian enamel, and of the rationale of it.

The proceſſes for reducing the calces of tin; and experiments to ſhew what happens to metallic bodies in the calcination and the reduction of them; with obſervations generalizing former inductions.

The beſt proceſs for forming the vitriol of tin; with obſervations on the phænomena, and on the vitriol of tin, the elaſtic fluid, the ſulphureous acid, and the ſulphur formed in this proceſs.

The proceſs for preparing the calx of tin by nitrous acid.

Experiments of the author ſhewing the different elaſtic fluids which may be obtained, during the action of nitrous acid on tin, in different circumſtances; and ſhewing divers phenomena and products of the calces of tin thus obtained.

Inductions concerning nitrous acid and air and phlogiſton and fire; and explanations of the phenomena of the calcination of different metallic bodies by nitrous acid, and of the weight of theſe calces.

The beſt proceſs for making the marine ſalt of tin, called ſal Jovis, in tranſparent cryſtals.

Obſervations on the inflammable gas detached in this proceſs, on the properties of ſal Jovis, and on the uſes of it in medicine, in dying, and in other arts.

Different phenomena of ſolutions of tin in weak and in ſtrong marine acid, explained.

The proceſſes for making the ſmoaking liquor of Libavius, and the butter of tin, with obſervations on the phenomena, generalizing former inductions.

Experiments ſhewing the action of tin and aqua regia on each other, with obſervations on the phenomena, and products; and particularly on the elaſtic fluids detached in theſe experiments.

The beſt proceſs for effecting the ſolution of tin in aqua regia, containing the greateſt poſſible quantity of nitrous acid for this purpoſe; and for making the gelatinous ſolution of tin, which is required in the beſt preparation of the purple powder of Caſſius, and which anſwers beſt for ſtriking ſcarlet dyes under the name of the compoſition, and for other purpoſes; with obſervations on the phenomena varied by different encheireſes.

Experiments ſhewing the action of tin and acetous acid on each other; the formation of calx of tin by acetous acid, acetous ſalt of tin, and inflammable gas; and divers phenomena.

The proceſs for making white pigments called magiſteries of tin; with obſervations generalizing former inductions.

Experiments ſhewing the action of tin or calces of tin, and of the acid and aceſcent bodies, which differ from thoſe already mentioned in this ſection, on each other.

Obſervations on the changes of colour induced in ſalts and calces of tin, by expoſure to common air, and eſpecially to phlogiſtic vapours.

Experiments ſhewing the action of tin, and of fixed and volatile alkalies ſoaps fats and neutral ſalts, on each other, in different circumſtances.

Decompoſitions of ſaline compounds of tin, affording calces of different colours; with obſervations.

Obſervations on the numerous ſolvents of tin; on pickling and other culinary arts; on the quick decay of the tinning of culinary veſſels; and on the effects of tin on ſauces and ſtewed victuals.

The proceſſes for calcining tin by nitre, and for producing the alkaline glaſs of tin, the alkaline ſolution of tin, the white calx of tin by nitre, and nitre alkalized and cauſtic by tin; and experiments of the author ſhewing what happens to the nitrous acid and the phlogiſton of tin in theſe proceſſes; with obſervations and inductions.

Proceſſes exhibiting the action of tin and ſulphur on each other in fuſion, and the matt of tin; with obſervations on theſe proceſſes, and on the properties of the matt of tin.

Proceſſes exhibiting the action of liver of ſulphur on tin.

The proceſs for making aurum moſaicum or aurum miſivum, with obſervations on the phenomena and various products.

The proceſs for making antihecticum Poterii.

The proceſſes for reducing the ſalts and calces and glaſſes of tin; or for reviving the tin of them, with the ſmalleſt loſs.

Proceſſes exhibiting the allay of tin with regulus of arſenic, the allay and calcination of tin with white arſenic; the allay of tin with nickel, and with cobalt; the allay of tin with biſmuth to make a ſolder for tin; the allay and ſtiffening of tin with regulus of antimony, to make an allay which ſwells remarkably in ſetting, and a kind of pewter; the allay of tin with zinc to make pewter; another allay of tin, to make the beſt pewter; and the allays of tin for ſpeculum metal, printers types, and other purpoſes; with obſervations.

The author's ſingular allay which catches fire in the fuſion, and burns rapidly; with obſervations and inductions.

SECTION XXI.

LEAD.

SPECIMENS of lead ſpars, lead ochres, and other calciform lead ores and of the mineralized lead ores, and improper ores of lead; with obſervations on them.

The proceſſes for dreſſing and aſſaying different lead ores, after the manner of the beſt modern aſſayers; with obſervations on theſe proceſſes, and on thoſe directed by chemiſts and docimaſtic writers.

Divers proceſſes in which the different methods of deſulphurating and ſmelting lead ores and purifying the lead, are exhibited, and the phenomena and products of the ſmelting houſes are ſhewn.

The rationale of theſe proceſſes, with obſervations on the phenomena; and inductions.

The metallurgic principles which ought to be obſerved in conſtructing furnaces, and in roaſting and ſmelting lead with mineral or vegetable fuel, with or without fluxes, ſkull-iron, or other additions; with obſervations on the ſlags and ſlag-lead of the Britiſh ſmelting-houſes, and on the improvements which may be made in this department.

Experiments ſhewing divers diſtinguiſhing characters of lead, and the action of fire on lead.

The proceſs for granulating lead.

Experiments ſhewing the priſmatic colours accompanying the partial dephlogiſtications of lead; with obſervations.

The beſt proceſſes for dephlogiſticating lead and preparing the grey calx of lead, or plumbum uſtum, and pale maſſicot, rich yellow maſſicot, pale red lead, red lead, and litharge.

Obſervations on the phænomena of theſe proceſſes, and general inductions.

Experiments ſhewing the quantity of air and of other matter imbibed by calces of lead; and ſhewing the changes produced in them, by depriving them of air and other matter; and ſhewing what happens to the phlogiſton of lead during the calcination; and ſhewing the tranſlation of phlogiſton from other bodies to calces of lead by the aid of fire, and without fire; with obſervations generalizing former inductions, and tending to eſtabliſh the author's notions of phlogiſton, and of divers other ſubjects.

Experiments ſhewing the ſcorifying and vitreſcent powers of calces of lead; and ſhewing glaſſes made with calx of lead and different unmetallic earths, and with calces of lead unmetallic earth and ſaline fluxes; and the effects of lead calx in docimaſtic or ſcorifying glaſſes, in ſtras, in flint glaſs, paſtes, and enamels; and the reaſons why red-lead is preferred before other calces of lead, in the glaſs-houſes.

Suggeſtions of the author concerning the cauſe of the imperfection of the moſt brilliant glaſſes, which are highly charged with lead calx, and uſed in optical inſtruments; and experiments with a view to remedy theſe imperfections.

Obſervations on the changes of electrical powers accompanying the calcination and vitrification of lead and other metals; and on the different electrical powers of different glaſſes, and of different veſſels made out of the ſame maſs of glaſs; and other obſervations, with ſuggeſtions relative to electricity.

Experiments ſhewing the action of vitriolic acid on lead, and the beſt methods of making vitriol of lead; and experiments ſhewing how to make phlogiſticated vitriol of lead.

Obſervations on theſe proceſſes; and the reaſons why leaden veſſels may be uſed in the place of glaſs, to retain or evaporate liquors containing diſengaged vitriolic acid, without being much corroded by them: alſo the reaſons why lead and vitriolic acid in the hands of inexperienced chemiſts do not yield inflammable gas and ſulphureous acid; and the reaſons why lead, in certain circumſtances, may be copiouſly diſſolved by vitriolic acid.

The beſt proceſſes for forming the nitre of lead; and for exhibiting the elaſtic fluids, which in different circumſtances are obtained, during the action of nitrous acid on lead and on calces of lead.

Experiments ſhewing divers properties of nitre of lead, and of calces of lead impregnated with nitrous acid; and ſhewing the nitrous gas and the pure air obtainable from theſe bodies; and exhibiting divers intereſting phenomena.

Inductions concerning nitrous acid, air, phlogiſton and fire.

Cautions againſt the miſtaken notions of the chemiſts, concerning nitre of lead; and againſt the notions of ſome experimenters, concerning earths and metallic calces impregnated with nitrous acid.

The beſt proceſſes for exhibiting the action of marine acid on lead; for preparing the white marine ſalt of lead, called plumbum corneum, the opaque ſaline maſs more properly called plumbum corneum, and the flores Saturni.

Obſervations on the phenomena and various products of theſe proceſſes.

Experiments ſhewing divers properties of plumbum corneum, and of flores Saturni.

Experiments ſhewing the action of aqua regia on lead.

Experiments ſhewing the action of acetous acid on lead, in the different circumſtances in which the lead is formed into a ſalt, or only calcined: and experiments ſhewing the action of acetous acid on calces of lead.

Obſervations on the manufacture of white lead, and on the author's experiments which ſhew the kinds of matter which compoſe white lead; and obſervations on the changes wrought in the lead and the acetous acid, in the foregoing proceſſes.

Inductions relative to phlogiſton, phlogiſticated air, fixable or acidulous gas, and other ſubjects.

Obſervations on the properties and uſes of white lead.

The proceſſes for making extract of Saturn or Goulard's extract, acetum lythargyrites, and ſugar of lead; with obſervations on the phenomena, and on divers properties of the products.

Proceſſes exhibiting the decompoſition of ſugar of lead by fire only; with obſervations on the phenomena, and on the ſpirit of Saturn, and the tinder of lead, and other products of theſe proceſſes.

Experiments ſhewing the order of the affinities of lead to the foregoing acids; and the uſe of nitrous and acetous ſolutions of lead, in the detection of vitriolic or marine acids or ſalts, in mineral waters or other liquors.

Obſervations on other properties and uſes of ſugar of lead.

Experiments exhibiting the action of other acids or acidulous bodies, beſides thoſe lately mentioned, on lead and calces of lead.

Experiments ſhewing the action of lead and fixed and volatile alkalies on each other; and ſhewing the alkaline ſolutions of lead; with obſervations generalizing former inductions, eſpecially thoſe concerning attraction and aggregation.

Experiments ſhewing the action of lead and nitre on each other ignited; and ſhewing what happens to the earth and phlogiſton of the lead, and to the acid and the alkali of the nitre, in theſe circumſtances; with obſervations generalizing former inductions.

The proceſs for preparing the flux of Antoine Amande.

Experiments ſhewing the action of lime and chalk and pot-aſh on lead calces ignited; with obſervations.

Divers proceſſes for decompoſing, by ſingle and compound elective attractions, the different ſalts of lead; and for preparing precipitated calces of lead of various colours, and the white calces of lead called magiſteries of lead; with obſervations on the phenomena, generalizing former inductions.

Experiments ſhewing the changes of colour induced in ſalts, calces, magiſteries, and pigments of lead, by expoſure to common air, and eſpecially by phlogiſtic vapours; with obſervations on Saturnine ſympathetic inks.

Experiments ſhewing the action of oils and balſams, and maſſicot, red-lead, litharge, white-lead, and magiſteries of lead, on each other; and the proceſſes for making drying-oils, oil of lead, paints, putties, oil cements, oil ſtuccos, and the following pharmaceutical ointments and plaiſters, containing lead: *viz.* emplaſtrum commune or diachylon, emplaſtrum commune adhæſivum, emplaſtrum commune cum gummi, emplaſtrum é minio, emplaſtrum defenſivum, emplaſtrum roborans, emplaſtrum é ſapone, unguentum é ceruſſa, unguentum tripharmacum, linimentum tripharmacum; with obſervations on theſe ſubjects, and on the phænomena of theſe proceſſes.

Obſervations on the effects of ſugar of lead, vinegar of lead, extract of Saturn, pulvis e ceruſſa compoſitus, tinctura Saturnina, tinctura antiphthiſica, and of other Saturnine compounds, on the human ſyſtem; and ſtrictures on the internal uſe of them in medicine.

Obſervations on the beſt methods of detecting Saturnine impregnations of vinous liquors; and on the proper uſe of the liquor vini probatorius.

Proceſſes exhibiting the action of ſulphur and ignited lead on each other, and the formation of lead-matt; with obſervations on divers properties and uſes of this matt, and on the order of the affinities of ſulphur to lead and the foregoing metallic bodies.

Proceſſes exhibiting the action of liver of ſulphur on lead ignited; with metallurgic and philoſophical obſervations.

Proceſſes for reviving the calces ſalts and other preparations of lead, by the phlogiſton of fuel or of metals, and the aid of fire; and proceſſes for reſtoring phlogiſton to theſe bodies and recovering the lead in its metallic form, in the humid way, or without the aid of fire; with obſervations generalizing former inductions.

Obſervations on the cauſes, and on the beſt preventatives, of the deleterious effects of lead, in the manufactories of white-lead, maſſicot, red-lead, ſheet-lead, ſhot, and leaden veſſels.

Obſervations on the cauſes of the like effects of chambers newly painted, and of oleaginous exhalations.

Proceſſes exhibiting the allays of lead with arſenic, with cobalt, with nickel with biſmuth, with antimony, and with zinc; and the allay of lead and tin, called plumber's ſolder; and the allay of lead tin and biſmuth, which melts in boiling water.

SECTION XXII.

COPPER.

SPECIMENS of native copper called virgin copper or ziment copper; of blue, green, red and other calciform ores of copper; of the mineralized proper and improper ores of copper; and of the native ſalts of copper; with obſervations on them.

The proceſſes for dreſſing and aſſaying different ores of copper, in the different methods practiſed by the beſt modern artiſts.

The author's principles of aſſaying, with a view towards the beſt metallurgy of any ore, as well as towards the quantity of its metallic contents.

Proceſſes exhibiting the different methods of roaſting and ſmelting copper ores; and ſhewing the phenomena and products of the ſmelting-houſes called blowing-houſes, and of the ſmelting-houſes wherein the regule proceſs is adopted.

The rationale of theſe proceſſes; with obſervations on the phenomena, generalizing divers inductions of the author.

Obſer-

Obſervations on the Britiſh manufacture of copper, on the common methods of purifying Britiſh copper, and on the differences between the beſt Britiſh copper and Japan copper.

Experiments of the author in order to meliorate Britiſh copper, and imitate or equal Japan copper.

Experiments ſhewing divers diſtinguiſhing characters of copper, and the action of fire on copper.

The proceſs for granulating copper.

Experiments ſhewing the priſmatic colours accompanying the partial dephlogiſtications of copper; and the colours imparted to flame, during the calcination or combuſtion of copper: with obſervations.

The beſt proceſſes for dephlogiſticating copper, and preparing copper ſcales, burnt copper, and coloured calces of copper, by fire.

Obſervations on the phenomena of theſe proceſſes, generalizing inductions relative to phlogiſton, fire, and air, and combuſtion; and the encreaſed weight of metals in calcination; and colour.

Experiments in order to eſtabliſh or correct the author's notions of phlogiſton, and of the affinities and tranſlations of it, and of the phenomena of calcination and reduction of metallic bodies, and of combuſtion.

Experiments ſhewing the effect of calces of copper, in promoting the vitrification of unmetallic earths; and the different colours imparted by different calces of copper, to glaſſes or fritts compoſed of different ingredients, and differently charged with the calces, and ignited in different degrees: and obſervations on the red and brown enamels, the yellow, green, and bluiſh green glaſſes, the mock emeralds and other falſe jewels and imitations of precious ſtones thus prepared and tinged with copper calces only, or with theſe and calces of cobalt nickel arſenic or tin.

Experiments ſhewing the action of vitriolic acid on copper, and the formation of vitriol of copper or vit. cœruleum, or Roman vitriol; with obſervations on the phenomena.

Experiments ſhewing the art of decompoſing pyrites of copper, to form Roman vitriol, as it is made in the great works; with obſervations on the phenomena generalizing former inductions, and particularly thoſe relative to attraction, combuſtion, phlogiſton, and air.

Experiments ſhewing divers properties of Roman vitriol.

Experiments ſhewing the kinds of matter which, excluſive of acid and cupreous earth, enter into the compoſition of Roman vitriol; with obſervations of the author.

The proceſs for making the pyrophorus of copper.

Proceſſes for decompoſing Roman vitriol, and for preparing cheap verditers and lakes, of divers colours.

The beſt proceſſes for forming the nitre of copper; and for exhibiting the elaſtic fluids and the vapours, which are obtained during the action of nitrous acid on copper, in different circumſtances, and which are likewiſe obtained from the nitre of copper, and from calces of copper impregnated with nitrous acid.

Experiments and obſervations of the author and of others, on nitrous gas, and nitrous vapour, and the air obtained in theſe proceſſes; and on the mixed elaſtic fluids in which the blaze of a taper is enlarged, coloured, extinguiſhed or otherwiſe affected: and the author's explanation of the cauſe of the ſudden and alternate extinctions and revivals of the flame of a candle immerſed in a veſſel filled with inviſible elaſtic fluids; and of the cauſes of many other ſtriking phenomena.

General inductions; and cautions againſt the erroneous notions lately revived concerning theſe ſubjects.

Obſervations on the eudiometer of the Chevalier Landriani; and experiments with the author's eudiometer, ſhewing the caſes in which ſuch inſtruments can, or cannot, ſhew the ſalubrity of air.

Experiments of the author ſhewing the ſparkling combuſtion of tin foil ſtratified with the nitrous ſalt of copper, or of tin foil coiled and immerſed in the nitrous ſolution of copper.

Obſervations on the phenomena of theſe experiments, generalizing former inductions.

Proceſſes exhibiting the action of marine acid on copper, and the preparation of marine ſalt of copper, and of certain green pigments and lakes of copper; with obſervations on the properties of theſe preparations.

The proceſſes for decompoſing ſal ammoniacus by copper or its calces, and for preparing flowers of copper, or ammoniacal ſublimate of copper, and corneous copper; with obſervations on the phænomena, and on the volatile alkaline and other products.

Experiments ſhewing divers decompoſitions of marine ſalt of copper, and the formation of precipitates and pigments or lakes of divers colours.

Experiments ſhewing the action of acetous acid, and of this acid mixed with air, on copper; and the principles of the manufacture of verdigriſe; and the changes wrought in the copper and acetous acid and air, in theſe proceſſes; with obſervations and inductions.

Experiments ſhewing the action of acetous acid on copper, and on calces of copper, in the circumſtances neceſſary for preparing acetous ſalt of copper, or diſtilled verdigriſe.

Experiments ſhewing divers properties of verdigriſe, and of diſtilled verdigriſe; with obſervations on the uſes to which they are applied by artiſts.

Experiments ſhewing the decompoſition of diſtilled verdigriſe, by fire only; with obſervations on the phænomena, and on the ſpirit of Venus, the tinder of copper, and other products of theſe experiments.

Obſervations on the action of other acids or acidulous bodies, beſides thoſe lately named, on copper or calces of copper.

Obſervations on the ruſt or the verdigriſe formed on copper, or cupreous allays long expoſed to air and moiſture.

Experiments ſhewing the action of copper or certain calces of copper, and fixed and volatile alkalies on each other; and the preparation of alkaline ſolutions or tinctures of copper; with obſervations on the phænomena.

The proceſs for making cuprum ammoniacum, with obſervations.

Experiments ſhewing the action of copper and nitre on each other ignited; with obſervations on the phænomena, and on the nitrous calx of copper, and the other products of theſe experiments.

The proceſs for making the tincture of metals or lilly of Paracelſus.

Divers proceſſes for decompoſing by ſimple or compound elective attractions the different venereal ſalts, and for preparing calces, pigments, and lakes of copper, different from the foregoing; with obſervations.

Experiments ſhewing the action of oils and copper or calces of copper on each other; and the preparation of green paints, and cupreous ointments and plaiſters, eſpecially *unguentum ex ærugine*, *unguentum baſilicum viride*, and *mel Ægyptiacum*; with obſervations.

Obſervations on the effects of Roman vitriol, *aqua vitriolica cærulea*, *aqua ſtyptica*, flowers of copper, *cuprum ammoniacum*, *pilulæ cæruleæ*, *aqua ſæpphirina*, cœleſtial water, *tinctura veneris volatilis*; and of cupreous ointments; and of other cupreous preparations in medical practice.

Obſervations on the beſt methods of detecting cupreous impregnations of mineral waters or other liquors.

Proceſſes exhibiting the action of ſulphur and copper ignited, on each other; and the formation of the matt of copper; with obſervations on the phænomena, and on the properties of this matt, and on the order of the affinities of ſulphur to copper and the foregoing metallic bodies.

The proceſs for preparing the calx of copper called æs uſtum; and the proceſs for making purple copper.

Proceſſes exhibiting the action of liver of ſulphur on copper and calces of copper; with metallurgic and philoſophical obſervations.

Proceſſes for reviving the calces, ſalts, and other preparations of copper, in the docimaſtic way; and proceſſes for reſtoring the phlogiſton, and recovering the copper, in its metallic form, from divers cupreous compounds, in the humid way, or without the aid of fire: and obſervations on theſe proceſſes, and on cupreous waters and ziment copper, generalizing former inductions.

Obſervations on the cauſes and the beſt preventatives of the deleterious effects of copper in different manufactories, and of copper veſſels uſed in cooking; and obſervations on bronzed copper, japanned copper or Pontipool ware, and enameled copper.

Proceſſes for allaying copper with arſenic, with cobalt, with nickel, with biſmuth, with antimony, and with lead; and for allaying three or more of theſe with each other; with obſervations on the phænomena and products.

Proceſſes exhibiting the allays of copper with tin, and the formation of bell-metal and bronze; with obſervations on theſe, and on the tinning of copper veſſels.

Proceſſes exhibiting the allays of copper with zinc, and the formation of Princes metal or pinchbeck, and of braſs, and of ſpelter ſolder.

Obſervations on theſe, and on the Britiſh manufacture of braſs; on Nuremberg braſs, foils, and wire; and on the probable means of meliorating Britiſh braſs.

Proceſſes exhibiting the allays of copper with two or more of the foregoing metallic bodies, and the formation of the beſt bronze bell metal, ſpeculum metal, type metal, and European white copper.

Obſervations on the foreign white copper called tuteneg or Indian plate.

Proceſſes for recovering copper from theſe allays; with obſervations on the art of recovering any of the foregoing metals or ſemi-metals from the allays or compound already named.

SECTION XXIII.

IRON.

SPECIMENS of red ochres and raddle, yellow ochres, brown ochres and umber, hæmatites or bloodſtones, kidney ore, iron balls, bog ore, bliſtered iron ore, ſpathoſe iron ores, and other calciform iron ores; with obſervations on theſe bodies, and a review of martial jaſpers, ſhirls, martial boles, martial ſands, martial mica, martial mangan eſe, tarras, and other compounded martial bodies, or improper ores of iron.

Specimens of marcaſite, mundic, and other ferrugineous pyrites; of iron ſtone, native magnets, black iron ore, call, emery ſtone, black martial ſand, lapis Hybernicus, martial coal ores, and other mineralized ores of iron; with obſervations on theſe bodies, native Pruſſian-like-blue, native martial ſalts, and on divers compounds natively impregnated with martial matter in conſiderable quantity.

The proceſſes for dreſſing and aſſaying different ores of iron; with docimaſtic obſervations.

Proceſſes exhibiting the different methods of roaſting and ſmelting iron ores, and the phænomena and products of the ſmelting houſes in which either coak or charcoal is uſed.

The rationale of theſe proceſſes.

Obſervations on the differences between pig-iron obtained by the means of charcoal from calciform ores of iron, and the pig-iron obtained by the Britiſh encheireſis from calciform or roaſted ſulphureous ores of iron.

Obſervations on the proceſſes for meliorating pig-iron, and producing red-ſhort iron, cold-ſhort iron, and tough iron.

Obſervations on the proceſſes for making natural ſteel, and on thoſe for converting iron into ſteel, or making artificial ſteel, and on the art of turning ſteel into iron.

Experiments ſhewing how thin veſſels, made of caſt iron, may be made tough, like thoſe made of malleable iron.

Experiments of the author ſhewing the poſſibility of rendering caſt iron more fuſible, and capable of making tough or malleable veſſels, in the firſt caſt.

The author's method of melting the moſt refractory bar iron, in a few minutes, in cloſe veſſels, and forming the beſt and cheapeſt ſteel.

Experiments ſhewing the differences between iron and ſteel.

Experiments ſhewing the principles of the art of tempering ſteel, and particularly of the ſpring-maker's art.

Obſervations on divers intereſting phænomena of theſe proceſſes and experiments, with inductions.

Experiments ſhewing divers remarkable properties of iron and ſteel; with obſervations.

The author's notions of magnetiſm, illuſtrated by experiments.

Experiments ſhewing the priſmatic colours accompanying the partial dephlogiſtications of iron or ſteel.

Experiments of the author, in order to ſhew the inflammable gas obtainable from clean iron ſtrongly ignited *per ſe*; and to explain the cauſe of the ſparkling of fuſed iron and of the fuſed matts of ſome other metallic bodies.

The proceſſes for making ſcales of iron or burnt iron or ſquamæ ferri præparatæ of the new Edinburgh pharmacopœia, and other more dephlogiſticated calces of iron, by fire; and experiments ſhewing rapid and luminous combuſtions of iron; with obſervations.

Experiments in order to correct or eſtabliſh the author's notions of phlogiſton, and of the affinities and tranſlations of it, and of the phenomena of calcination and reduction of metallic bodies, and of combuſtion, and of phlogiſticated air.

Experiments ſhewing the effect of calces of iron in promoting the vitrification of unmetallic earths; and ſhewing the different colours imparted by different calces of iron, to glaſſes, ſtras, enamels, and fritts compoſed of different ingredients, and differently charged with the calces of iron, and ignited in different degrees: and obſervations on the black, brown, reddiſh, yellow, and green glaſſes or enamels, and the falſe hyacinths, and imitations of natural ſtones, thus prepared and tinged with iron calx only, or with calces of iron and one or other of the foregoing calces.

Experiments ſhewing the action of air and of water on iron, with obſervations on chalybis rubigo præparata or martis Linnatura præparata, and Æthiop's martis.

Obſervations on the chemical properties and medicinal effects of theſe martial preparations.

Experiments ſhewing the ſolution of iron in diluted vitriolic acid; and the formation of martial vitriol or ſal martis or copperas, and of inflammable gas, and ſulphureous acid; with obſervations on the phenomena and products.

Experiments ſhewing the ſlow and rapid combuſtions of inflammable gas, and the exploſive inſtantaneous combuſtions of it, in divers circumſtances of expoſure to common air, or of mixture with common air or dephlogiſticated air or nitrous vapour; and ſhewing divers other properties of inflammable gas, and the decompoſition of it in the act of combuſtion.

Experiments of the author ſhewing the action of concentrated oil of vitriol and iron on each other; with obſervations on the white ſaline maſs, the volatile vitriolic acid, and the ſulphur formed in this proceſs; and the reaſons why little or no inflammable gas is detached in this circumſtance.

Inductions relative to divers ſubjects already mentioned, and particularly concerning the compoſition of inflammable gas.

Experiments ſhewing the principles of the art of decompoſing pyrites of iron to form copperas, as it is made in the manufactories; and the art of purifying copperas from copper and other noxious metals; with obſervations on the phenomena, generalizing former inductions, and particularly thoſe relative to air, phlogiſton, and fire.

Experiments ſhewing divers properties of copperas or martial vitriol.

Obſervations on the aqua ſtyptica of the new Edinburgh pharmacopœia.

Experiments of the author ſhewing the kinds of matter excluſive of the acid martial earth and the water of cryſtalization, which enter in the compoſition of copperas; and ſerving to explain the ſpontaneous changes which martial mineral waters and ſolutions of copperas undergo by expoſure to the open air; with obſervations on the phenomena of theſe experiments generalizing ſeveral of the foregoing inductions.

Review of the phenomena occurring in the decompoſition of martial vitriol, by fire; with obſervations on the dew of vitriol, calcined vitriol, colcothar of vitriol, and waſhed colcothar or ſweet earth of vitriol; and on the technical and medicinal uſes of calcined vitriol and colcothar.

Obſervations on the metallic compound called lapis medicamentoſus P. L. and on the emplaſtrum roborans P. E.

The proceſſes for making the martial pyrophori; with obſervations and inductions.

Proceſſes exhibiting divers decompoſitions of martial vitriol and the preparation of olive precipitate of Mars.

Obſervations on the pilulæ ecphracticæ P. Lond.

Experiments ſhewing the action of nitrous acid on iron, in different circumſtances, and the formation of nitrous ſolution of iron, nitrous phlogiſtic vapour, and nitrous gas; with obſervations on the phenomena.

Experiments ſhewing the capacity of ſaturated nitrous ſolution of iron to diſſolve freſh iron, ſucceſſively preſented, in great quantity; and ſhewing the calx of iron thus prepared and called ſaffron of Mars by nitrous acid.

Experiments of the author ſerving to illuſtrate his theory of the foregoing phenomena, and at the ſame time to exhibit an unexceptionable analyſis of nitrous acid and of nitrous gas; to ſhew the pure air of nitrous acid and of nitrous gas; and to explain the phenomena of the dilatation extinction and immediate revival of the flame of a candle, and of the repeated revivals and extinctions of ſuch flame, in certain elaſtic fluids, together with divers other phenomena produced by nitrous acid diluted or undiluted and iron only.

Inductions generalizing divers controverted notions of the author.

Experiments in order to exhibit new inſtances, in addition to thoſe already diſcovered by the author, of a viſible and vivid combuſtion of metals, by means of acid vapour; and with a view towards the correction or eſtabliſhment of his notions of air, phlogiſton, fire, and combuſtion.

Proceſſes exhibiting the action of ſpirit of ſalt and of marine acid gas on iron and calces of iron, and the formation of cryſtals of marine ſalt of iron, and of inflammable gas; with obſervations on theſe.

Experiments ſhewing divers properties of the marine ſalt of iron; and particularly the avidity with which it imbibes nitrous gas, and its capacity to imbibe and combine with air; and obſervations on the various phenomena occurring in theſe experiments.

Proceſſes exhibiting the abſorption of nitrous gas, and of air, by other bodies which actually combine with theſe elaſtic fluids in the inſtant of abſorption.

Proceſſes for decompoſing ſal ammoniacus by iron or calces of iron; and the beſt proceſſes for making martial flowers like thoſe of the London pharmacopœiæ; and for making ferrum corneum and the black martial ſublimate; and for making lixivium Martis or oleum Martis per deliquium or eſſentia Martis; and for ſaving the elaſtic fluid detached on this occaſion.

Obſervations on the injudicious proceſſes of our pharmacopœiæ; and ſtrictures on the cheap ſubſtitute ſometimes ſold.

Experiments ſhewing the action of alkohol and ferrum corneum on each other, and the preparation of dulcified ſpirit ſtrongly charged with iron; with obſervations on the chemical properties of this compound.

The proceſs for making tinctura martis in ſpiritu ſalis; and compariſons of this with the foregoing pepa-ration.

Obſervations on the ſpecificum adſtringens Maetzii.

Proceſſes exhibiting the action of aqua regia on iron and calces of iron; with obſervations on the different elaſtic fluids detached in theſe proceſſes.

Experiments ſhewing divers decompoſitions of marine ſalt of iron, and the preparation of precipitates and lakes of different colours; with obſervations on the phenomena of theſe experiments and on certain properties of theſe precipitates.

Proceſſes for exhibiting the action of acetous acid and iron on each other, in different circumſtances, and for preparing acetous ſolution and acetous ſalt of iron; with obſervations on the inflammable gas and other products of theſe proceſſes.

Experiments ſhewing the decompoſition of acetous ſalt of iron by fire only, by air and fire, and by other means; and experiments in order to inveſtigate the compoſition of acetous acid and of acidulous gas.

The preparation of vinum chalybeatum.

Proceſſes for exhibiting the action of iron and tartar on each other, and for preparing chalybs tartarizatus or mars ſolubilis, martial vulnerary balls, and the mixture of iron with the alkaline coal of tartar, called mars ſolubilis al kalizatus; with obſervations on the phenomena, on the chemical properties of the products, and the medicinal uſes of them.

The proceſs for making Ludovicus's tincture of mars.

Obſervations on the action of other acids and acidulous bodies on iron, in different circumſtances; and remarks on the phenomena which ſeem to indicate that water, impregnated with the acidulous gas called fixable air, is capable of diſſolving iron and other metals.

Experiments ſhewing the action of fixed and volatile alkalies on iron and certain calces of iron, and the preparation of alkaline ſolutions or tinctures of iron; with obſervations on the phenomena, on divers chemical properties of theſe martial alkaline ſolutions, and on the medicinal uſes of them.

The proceſs for making Stahl's ſaffron of mars, with obſervations on the medicinal uſe of it.

Experiments ſhewing the action of iron and nitre on each other ignited; with obſervations on the phenomena, and on the calx of iron called Zwelfer's ſaffron of mars, on the elaſtic fluids detached in theſe experiments, and on the condition of the alkali of the nitre.

Divers proceſſes for making olive-coloured, green, and blue precipitates of iron; with obſervations on the phenomena, and on the different properties of theſe calces.

The author's proceſs for making Pruſſian-blue of divers ſhades; with his theory of the proceſs, and obſervations on the phenomena.

Obſervations on other proceſſes of chemiſts, for making Pruſſian-blue.

Experiments ſhewing divers properties, and the compoſition, and the analyſis of Pruſſian-blue; with obſervations on the volatile alkali, and the magnetic tinder of iron obtained in ſome of theſe experiments.

Experiments of Mr. Delaval ſhewing certain changes diſcharges and revivals of the colour of Pruſſian-blue.

Experiments ſhewing the phenomena of martial ſympathetic inks; with explanations, and obſervations on the Pruſſian dye.

Experiments ſhewing the impregnation of fixed vegetable alkali with the phlogiſtic and volatile alkaline matter of Pruſſian-blue; and the tranſlation of this part of Pruſſian-blue, to divers metallic earths, to form precipitates and lakes of divers colours.

Mr. Delaval's proceſſes for diſſolving iron by means of water and vegetable aſtringent ſubſtances, and for procuring blue, black, purple, and other coloured ſolutions or inks; with obſervations on the phenomena, and ſuggeſtions concerning the matter of vegetable aſtringent ſubſtances, and the operation of them, in the human ſyſtem, and in divers arts.

Proceſſes exhibiting the action of vegetable aſtringents on martial ſolutions, and the common art of making ink, martial ſtains, and dyes.

Experiments ſhewing the cauſes of the decay or changes of ink, in manuſcripts; and the methods of making new writing to look old, and writing illegible by age, to become legible; and the art of totally effacing and again recovering the common manuſcripts; with a view to make theſe arts generally known and uſeful or harmleſs.

Obſervations on the martial ſympathetic inks, whoſe colour, when it is brought forth, is yellow, or green, or black.

The theory of the preparation of martial ſympathetic inks, common ink, and marking ink; and of the formation and uſe of martial dyes; and of the production of iron moulds; and of the art of diſcharging iron moulds from cloth of every kind.

Obſervations on the duration of the colour of the oily matter called printers ink.

Experiments ſhewing the author's method of making ink, better coloured, more durable, and leſs liable to be injured or effaced by acids, than any other heretofore publiſhed.

Obſervations on the effects of olive, green, blue, purple and black precipitates of iron, in medical practice; and on the tinctura ſtyptica of the London college.

Obſervations on divers methods of detecting martial impregnations of mineral waters and of other liquors; and particularly on Mr. Delaval's accurate teſts of martial and other ſlight impregnations which elude the vulgar teſts.

Proceſſes exhibiting the action of iron and ſulphur ignited, on each other, and the formation of matt of iron or artificial martial pyrites.

Experiments ſhewing divers phenomena of martial matt expoſed to air, water, and the action of other bodies.

The proceſſes for preparing *mars ſulphuratus* and *chalybs cum ſulphure præparatus*, *crocus martis aperiens*, and *crocus martis aſtringens* of the late Edinburgh pharmacedœia.

Obſervations on theſe medicines, and on the *lapis hæmatites præparatus*, and *lapis hybernicus præparatus* ſtill retained by ſome practitioners.

Experiments ſhewing the circumſtances in which iron filings and ſulphur mixed, do not act on each other ſenſibly; and the circumſtances in which they act to a certain degree and no further; and the circumſtances in which they decompoſe each other, burſt the ſtrongeſt veſſels; and fire ſpontaneouſly: obſervations on the agency of water and air in ſome of theſe experiments, and on the changes or new combinations of the martial earth, acid, phlogiſton, air, and water; with inductions.

Proceſſes for combining iron with liver of ſulphur, and exhibiting divers properties of this compound; with obſervations.

Obſervations on the order of the affinities of ſulphur to iron and the foregoing metallic bodies.

Obſervations on the numerous ſolvents of iron; on the ruſting and decay of iron; on the means of preventing this inconvenience; on black iron ware, and japanned iron.

Proceſſes for recovering the iron in its metallic form from martial ſalts, calces, and calciform compounds, in the docimaſtic way by fire; and for recovering iron from divers martial ſalts and calces, in the humid way, without the aid of fire; with obſervations generalizing former inductions.

Proceſſes for allaying iron with arſenic, with cobalt, with nickel, with biſmuth, with zinc and with copper.

Proceſſes for allaying iron with tin; and obſervations on the art of tinning plate iron.

Proceſſes for allaying iron with regulus of antimony, and with crude antimony to make the fiery metal.

Obſervations on divers phenomena of theſe proceſſes; on the properties of theſe allays; on magnetiſm; and on the productions of fire or burning ſparks, by the colliſion of bodies.

Obſervations on the incapacity of iron and lead to alloy with each other, and on the technical advantages reſulting from this kind of repugnance of iron to lead.

Metallurgic principles deduced from the foregoing proceſſes, with a view towards the depuration of metals.

SECTION XXIV.

MERCURY.

SPECIMENS of native mercury or virgin quickſilver, of mineralized quickſilver or cinnabar, and cinnabarine ores; with obſervations.

The proceſſes for obtaining mercury from its ores, and for purifying mercury; with obſervations.

The art of aſcertaining the purity of mercury.

Obſervations on the powder of mercury formed by trituration, and on the means of powdering mercury expeditiouſly, to make the black mercurial powder ſold by ſome empyrics.

Experiments ſhewing the action of fire on mercury, and divers properties of mercury; and obſervations on the phenomena which ſhew the forcible adheſion of phlogiſton in mercury, or what is vulgarly called the perfection or indeſtructibility of mercury.

Obſervations on the experiments in which mercury is rendered ſolid and ductile.

Obſervations on the experiments in which mercury appeared to ſome chemiſts to be converted into water: and experiments of the author ſhewing how water may be obtained in great quantity from the common air, whether mercury be uſed or not; and ſhewing that the air, which is called moiſt, may contain leſs water than is contained in that which is called dry air; and exhibiting the circumſtances in which air is incapable of retaining any moiſture, and thoſe in which it diſſolves water moſt copiouſly.

The beſt proceſs for calcining mercury, and preparing the red calx, called mercurius præcipitatus per ſe; with obſervations on the phenomena, and on divers properties and uſes of this calx.

Experiments ſhewing the pure air and other matter which combines with the mercury during the calcination of it, and the revival of the mercury by the ſole action of fire; with obſervations on the fixity of this mercurial calx, and on the relative quantities of phlogiſton in mercury and its calx.

Experiments ſhewing the action of vitriolic acid and mercury on each other: and proceſſes for preparing vitriol of mercury, vitriolic acid phlogiſticated by mercury, waſhed vitriol of mercury, oil of mercury, mercurius emeticus flavus or Turbith mineral, and the yellow precipitate by fixed alkali.

Obſervations on the phenomena which ſhew that mercury is deprived of a certain portion of its phlogiſton, in ſolutions and other combinations of it.

Experiments ſhewing divers chemical properties of Turbith mineral, and the uſe of it in arts.

Experiments ſhewing the elaſtic fluid obtainable from Turbith mineral, and the revival of the mercury, by fire.

Obſervations on the phenomena of theſe experiments and proceſſes; and on the medicinal character of Turbith mineral.

The beſt proceſſes for forming the nitre of mercury, and ſaturated nitrous ſolution of mercury, and for exhibiting the elaſtic fluids and the vapours which are obtained during the action of nitrous acid on mercury, in different circumſtances.

Experiments ſhewing the elaſtic fluids obtainable by ignition, from the nitre of mercury and mercurial calces impregnated with nitrous acid.

Obſervations on the phenomena of theſe proceſſes; generalizing former inductions.

The beſt proceſs for making mercurius corroſivus ruber: the rationale of this proceſs, and obſervations on the phenomena.

Obſervations on the unguentum citrinum.

Experiments ſhewing the kinds of matter of which mercurius corroſivus ruber conſiſts; with obſervations on divers chemical properties of it, and on its medicinal effects.

The proceſs for making pulvis principis, panacea mercurii rubra, and arcanum corallinum; with obſervations.

Proceſſes exhibiting the combination of mercury with marine acid, and the preparation of mercurius corroſivus ſublimatus, in the method of the beſt modern artiſts.

Obſervations on the phenomena and products of theſe proceſſes, generalizing ſeveral of the foregoing inductions.

Strictures on the expenſive proceſſes of the London and Edinburgh pharmacopœiæ for preparing mercurius corroſivus ſublimatus; and obſervations on the reſiduary matter of theſe proceſſes.

Experiments ſhewing divers chemical properties of mercurius corroſivus ſublimatus; and obſervations on the effects of it on the human ſyſtem.

The proceſs for combining mercurius corroſivus ſublimatus with mercury, and forming mercurius dulcis of firſt ſublimation, mercurius dulcis of the London college, calomel, or aquila alba, and the mildeſt mercurius dulcis by elutriation or ſweet panacea of mercury.

Obſervations on divers phenomena and products of theſe proceſſes; on the chemical properties of mercurius dulcis, and on its medicinal effects.

Proceſſes for making mercurius dulcis in the humid way, and the proceſs of the London college, for making mercurius precipitatus albus.

Obſervations on the unguentum e mercurio præcipitato, P. L.

The proceſs for making Ward's white drop, ſal alembroth or ſalt of wiſdom, and the concentrated ſolution of mercurius corroſivus ſublimatus, which is uſed as a medicine, and moſt effectually deſtroys buggs.

Obſervations on the mercurial tincture of Garaye.

Experiments ſhewing the uſe of the foregoing ſolutions, or ſalts of mercury, in diſcovering certain impregnations of mineral waters or of other liquors.

Obſervations on the ſlow action of ſpirit of ſalt and of marine acid gas on mercury in its ordinary ſtate; and on the proceſſes in which mercury appears to attract marine acid ſtrongly; and inductions relative to the common acids, and aggregation.

Experiments ſhewing the ſlow action of acetous acid on mercury; and the art of combining acetous acid with mercury expeditiouſly, and of making mercurial acetous ſalt.

Experiments ſhewing the chemical properties and compoſition of acetous ſalt of mercury; with obſervations on divers phenomena, and on the medicinal character of this mercurial preparation.

Obſervations on Keyſer's pill, and on the other empyrical medicines uſed under the name of vegetable preparations, but containing mercurial acetous ſalt.

The proceſs for making mercurius tartarizatus.

The author's proceſs for combining mercury with acidulous gas, and making his ſoluble precipitate; with obſervations.

Experiments ſhewing the action of other acids and acidulous bodies, beſides thoſe lately mentioned, on mercury, mercurial ſolutions and calces; with obſervations.

Experiments ſhewing the action of alkaline gas on mercury.

Proceſſes for combining mercury with fixed or volatile alkalies, and for preparing alkaline ſolutions or tinctures of mercury: and obſervations generalizing ſeveral of the foregoing inductions.

Experiments ſhewing divers decompoſitions of vitriolic, nitrous, marine, and acetous ſalts of mercury, by ſimple and compounded elective attractions; and ſhewing the preparation of black, grey, white, yellow, roſe-coloured, red and brown precipitates of mercury; and exhibiting the art of ſtaining or colouring animal and other ſubſtances by mercurial ſolutions.

Obſervations on aqua phagedænica.

The proceſſes for dividing or extinguiſhing mercury by the means of oils, fats, balſams, ſaccharine bodies, calcareous earth and other ſubſtances; and for preparing mercurius alkalizatus, mercurius ſaccharatus, pilula mercurialis, P. E. unguentum mercuriale, unguentum cæruleum fortius, unguentum cæruleum mitius, ceratum mercuriale, emplaſtrum commune cum mercurio, pilulæ mercuriales P. L. pilulæ Æthiopicæ, and other mercurial compounds: and obſervations on theſe preparations.

Experiments ſhewing the beſt methods of detecting mercurial impregnations or poiſons.

Proceſſes exhibiting the partial union of mercury with ſulphur, by trituration; and the union of mercury and ſulphur by fuſion and by ſublimation; and the preparation of Æthiop's mineral P. L. Æthiop's mineral by fire, cinnabaris factitia, cinnabaris antimonii, and vermillion.

Obſervations on the phenomena of theſe proceſſes, and on the chemical properties and medicinal effects of the products.

Proceſſes exhibiting the action of liver of ſulphur and volatile liver of ſulphur on mercury; and ſhewing the formation of Æthiop's mineral and vermilion, in the humid way: and obſervations on the phenomena of theſe proceſſes and on compounded attractions in general.

Proceſſes ſhewing the beſt methods of applying mercurial fumigations in diſeaſes.

Obſervations on the black mercurial panacea or violet mercury of Lemeri; on the Æthiops antimonialis commonly uſed in England, and on the Æthiops antimonialis of Mr. Malouin.

Obſervations on the order of the affinities of ſulphur to mercury and the foregoing metallic bodies.

Proceſſes for recovering the mercury from all the calces, ſalts, ſulphureous compounds and other preparations of mercury, and for obtaining *revived* mercury or *animated* mercury, by fire. Proceſſes for recovering mercury, in its metallic form, from mercurial compounds, in the humid way, or without the aid of fire. Obſervations on theſe proceſſes, and on the art of gilding by mercury, or the pretended converſions of baſe metals into ſilver by menſtrua.

Experiments in order to determine whether mercury can be allayed with arſenic or cobalt or nickel or iron.

Experiments ſhewing the allays or amalgams of mercury with biſmuth, antimonial regule, lead, and copper.

Experiments ſhewing the amalgamation of mercury with tin, and the preparation of argentum muſivum and Canton's amalgam for electrical rubbers; and the amalgamation of mercury with zinc to form the author's amalgam for the like purpoſe.

Obſervations on the pretended fixations of mercury, and on the amalgam uſed for anatomical injections.

Proceſſes for recovering the mercury from the foregoing amalgams, and for exhibiting the cryſtalization of divers metallic bodies, in mercury.

General inductions.

Obſervations on the order of the affinities of mercury other bodies.

SECTION XXV.

SILVER.

SPECIMENS of native ſilver or virgin ſilver, mineralized ſilver ores, and ores of divers metals containing ſilver in conſiderable quantity and called improper ores of ſilver; with obſervations on them.

Proceſſes exhibiting the beſt methods of obtaining the moſt valuable metallic contents of divers proper and improper ſilver ores, and of ſeparating the imperfect metals from the ſilver or bullion.

Proceſſes exhibiting the beſt methods of ſmelting the different kinds of ſilver ores, to obtain the moſt valuable metallic contents of them; and to ſhew the phenomena of the ſmelting-houſes.

The rationale of the metallurgy of ſilver ores; and eſpecially of calcination, ſcorification, cupellation, and teſting.

The art of obtaining ſilver of the greateſt purity, for chemical experiments.

The art of granulating ſilver.

Experiments ſhewing the action of fire on ſilver, the perfection or indeſtructibility of ſilver, and divers proper-of ſilver.

Experiments ſhewing the action of nitrous acid and ſilver on each other, the preparation of ſaturated nitrous ſolution of ſilver and of lunar nitre, and the formation of nitrous gas.

Obſervations on the phenomena of theſe experiments, and on divers chemical properties of lunar nitre.

Experiments ſhewing the principles of the arts of dying and ſtaining divers animal, vegetable, and ſtoney ſubſtances, with ſilver.

Obſervations on the coſmetic uſe of lunar water, in changing the red colour of the hair to brown or black.

The proceſs for making lunar cauſtic; with obſervations on the phenomena, and on cauſtics.

Obſervations on the medicinal characters of lunar ſalts, and on Boyle's lunar pill.

Proceſſes for combining ſilver with vitriolic acid and preparing the vitriol of ſilver.

And obſervations on the phlogiſtication of vitriolic acid by ſilver, on divers phenomena of theſe proceſſes, and on the properties of vitriol of ſilver.

Proceſſes for combining ſilver with marine acid, and forming the ſemi-opaque luna cornea and the white cryſtals of luna cornea.

Experiments ſhewing divers properties of luna cornea; and obſervations on the uſes of it in arts.

Proceſſes for combining ſilver with acetous acid, and making the acetous ſalt of ſilver.

Obſervations on the circumſtances in which ſilver reſiſts the menſtrual powers of vitriolic marine and acetous acids; and on the circumſtances in which it is readily combined with theſe: and inductions relative to aggregation and ſaturation.

Experiments ſhewing divers decompoſitions of the different lunar ſalts, and the formation of precipitates and calces of ſilver of divers colours; with experimental illuſtrations of compounded attractions.

Obſervations on the compoſition of lunar calces.

Experiments ſhewing the art of impregnating ſtras, fritts, and glaſſes, with ſilver calx, and of making artificial topaz, falſe jewels, and enamels of different ſhades of yellow.

Experiments ſhewing the uſe of nitrous ſolution of ſilver in detecting divers impregnations of mineral waters and other liquors.

Obſervations on the changes of colour which happen to ſalts and calces of ſilver, in certain circumſtances.

Obſervations on the order of the affinities of ſilver to the different acids of the chemiſts.

Suggeſtions concerning the fixity and chemical indeſtructibility of ſilver, and the revival of calces of ſilver by ignition only: and obſervations on the proceſſes in which ſilver is deprived of a certain portion only of its phlogiſton, whilſt other metals are in the like circumſtances rendered incapable of being reduced by fire alone.

Proceſſes exhibiting the combination of ſilver with alkalies, and the alkaline ſolutions of ſilver.

Obſervations on the properties of theſe alkaline ſolutions.

Proceſſes exhibiting the action of ſulphur and ſilver on each other ignited, and the properties of the matt of ſilver.

Proceſſes exhibiting the action of liver of ſulphur on ſilver, and the effects of ſulphureous vapours, bilge water and foul air, on ſilver; with obſervations.

Obſervations on the order of the affinities of ſulphur to ſilver, and the foregoing metallic bodies.

Proceſſes for recovering ſilver from the foregoing ſalts, calces, glaſſes and ſulphureous compounds.

Proceſſes exhibiting the art of gilding by lunar menſtrua or ſalts; with obſervations on the phenomena, and on the pretended converſions of baſe metals into ſilver.

Proceſſes exhibiting the allays of ſilver with arſenic, cobalt, regulus of antimony, biſmuth, zinc, tin, lead, and iron.

Proceſſes exhibiting the phenomena which occur in attempting to allay ſilver with nickel: and ſhewing the allay of ſilver with copper to make the Britiſh ſtandard ſilver and the baſer ſilver allowed in ſome arts.

Obſervations on the lunar allays for ſpeculum metal.

The proceſs for allaying ſilver with mercury, or making ſilver amalgam; with obſervations on the phenomena, on the art of making ſilver powder, and of gilding with ſilver amalgam.

Divers proceſſes for making the arboreſcent cryſtals of ſilver and mercury, called arbor Dianæ or the ſilver tree.

General inductions from the phenomena of theſe allays and cryſtalizations.

Obſervations on the order of the affinities of ſilver to the metallic bodies with which it allays.

Proceſſes exhibiting the art of obtaining the ſilver, with the ſmalleſt loſs, from any metallic mixture, and of refining baſe or ſtandard ſilver to bullion, and of prejudging the value of baſe plate or allayed ſilver by the touchſtone and proof-needles, and of *aſſaying for the value* of allayed ſilver.

SECTION XXVI.

GOLD.

OBSERVATIONS on the proper ores of gold, native gold-duſt, and improper ores of gold.

Obſervations on the methods of extracting gold from the rich and proper ores of gold, and from ſand containing gold-duſt, in the great works.

Proceſſes exhibiting the art of working ores impregnated with gold, to obtain the gold and other valuable contents of them; and ſhewing the art of recovering the gold from the ſweepings of goldſmiths and other artiſts.

Proceſſes exhibiting the action of fire on gold, and divers properties of gold: and obſervations on theſe properties, eſpecially that which is vulgarly called the indeſtructibility of gold; on gold-leaf, gilded wire, called gold-wire, and on gilded and plated wares.

Proceſſes exhibiting the inſolubility of gold in its ordinary ſtate, in the ſeveral chemical acids.

Proceſſes exhibiting the beſt method of effecting a ſpeedy ſolution of gold in aqua regia, and making cryſtals of gold; with obſervations on the phenomena.

The proceſs for preparing the *yellow calx of gold by evaporation*, and for exhibiting the elaſtic fluids obtainable from cryſtals of gold.

The beſt proceſs for preparing the calciform precipitate of gold, called fulminating gold.

Experiments ſhewing divers ſingular properties of fulminating gold.

Experiments in order to ſhew the kinds of matter of which fulminating gold is compoſed, and to inveſtigate the true cauſe of its fulmination.

The author's notions of this ſubject.

The beſt proceſs for preparing the purple precipitate of Caſſius, with certainty.

Obſervations on the phenomena of this proceſs, generalizing former inductions.

Proceſſes for obtaining other precipitates of gold, of divers colours.

Proceſſes for precipitating gold in its metallic form and with high luſtre, from the royal ſolution.

Proceſſes exhibiting the ſolution of gold in vitriolic, nitrous, marine, acetous, and other acids.

Obſervations on theſe proceſſes, and inductions relative to acids and aggregation.

Divers proceſſes for decompoſing theſe ſolutions and the ſalts of them, and obtaining precipitates of different colours.

Divers experiments ſhewing the common art of colouring glaſſes with calces of gold; and the author's art of making falſe rubies and red enamels, and falſe jewels of all the colours which gold can impart, and of the different colours compoſed of theſe and of the tints of other metallic calces.

Obſervations on divers ingenious works of modern artiſts, imitating the precious ſtones and intaglio; and on their arts of ſtaining glaſs, enamel painting, and painting on porcelain and on the new Staffordſhire ware.

Experiments ſhewing the arts of imparting different colours to animal vegetable and ſtoney ſubſtances by ſolution of gold, and the principles of theſe arts; with obſervations relative to colour and divers other ſubjects.

Experiments ſhewing the ſolution of gold in fixed and volatile alkaline liquors; with obſervations.

The proceſs for diſſolving gold in water by means of liver of ſulphur.

Proceſſes for effecting the ſolution of gold in dulcified ſpirit, æther, oil of wine, and eſſential oils, and for preparing the empyrical drops, tinctures, elixirs, radical ſolutions, or potable gold, ſold under various names.

Obſervations on the real and pretended effects of ſolar medicines.

Experiments ſhewing the precipitation of gold in its metallic form and aggregated, from theſe menſtrua.

Proceſſes exhibiting the allay or amalgamation of gold with mercury.

Obſervations on the art of gilding with ſolar menſtrua, with the rag, with gold leaf, and with gold amalgam called *Or molu.*

Proceſſes exhibiting the allays of gold with ſeveral other metals, and eſpecially with copper to make the Britiſh ſtandard gold and the baſer gold allowed in ſome arts.

The proceſs for allaying gold with ſilver in different proportions.

Proceſſes exhibiting the art of ſeparating gold from any allay, conſiſting of gold and imperfect metals or ſemi-metals; of ſeparating gold from its allay with ſilver; of aſſaying for the value of gold; and of preparing the pureſt grain gold, and gold in cornets: obſervations on theſe proceſſes and particularly on ſcorification, cupellation, teſting, quartation or parting by aqua-fortis, cementation or concentrated parting, dry parting or parting by fuſion, the purification of gold in balneo ſolis, the art of hightening the colour of pale gold, and the tempering of gold.

Obſervations on the affinities of gold to divers other ſubſtances.

Obſervations on the true cauſes of the durable value of gold.

SECTION XXVII.

PLATINA.

SPECIMENS of grain platina, with obſervations.

Proceſſes exhibiting the art of ſeparating the platina from the other metallic contents of platina grains.

Obſervations on the experiments of Doctor Lewis and other reſpectable chemiſts, and on the later experiments of Meſſrs. De Liſle and Morveau, on platina.

The author's method of fuſing platina to form to a ductile maſs, by the ſole action of the moſt intenſe furnace fire.

Experiments ſhewing divers properties of platina; and obſervations on the indeſtructibility of this metal, its capacity to weld like ſteel, its extreme hardneſs, and its other properties, which render it valuable.

The beſt proceſs for diſſolving platina in aqua regia, to make the regal ſolution and ſalt of platina.

The proceſs for preparing the *calciform powder of platina by evaporation.*

Divers proceſſes for obtaining calciform and other precipitates of Platina, variouſly coloured, from the royal ſolution.

Experiments ſhewing the colours imparted to animal and other ſubſtances by ſolutions of platina.

Experiments ſhewing the calciform precipitates of divers colours, obtainable in the decompoſition of the ſolution of platina; and ſhewing the precipitation of platina in its metallic form, from this liquor.

Obſervations on the order of the affinities of platina and of other metals to the chemical acids.

Experiments ſhewing the ſolution of platina in ethers and other liquors, and the precipitation of it, in its aggregate and metallic form, from theſe.

Obſervations on the ſolution of platina in water by the intervention of hepar ſulphuris.

Experiments of the author ſhewing the colours imparted, by calces of platina, to glaſſes and enamels.

Experiments ſhewing the allays of platina with ſeveral other metals and with ſemi-metals; and particularly the allay of platina with copper called Indian gold, the allay of platina with ſilver, and the allay of platina with gold which eludes all the vulgar methods of diſcovering the impurity of ſuch gold, or the value of it.

Obſervations on the amalgamation of platina.

Proceſſes exhibiting the art of diſcovering the adulteration of gold by platina, and of ſeparating platina from gold and from ſilver.

SECTION XXVIII.

VULGAR ANALYTIC CHEMISTRY.

GENERAL obſervations on the action of fire and menſtrua on the compounded animal vegetable and mineral ſubſtances which have not been fully examined in this view, or have not been mentioned in the preceding part of the courſe; with ſpecimens and experimental illuſtrations.

Cautions concerning the falſe concluſions drawn from this pretended analyſis of bodies, and advices concerning the proper objects and uſes of the vulgar analytic chemiſtry.

☞ *The author has not time at preſent to anounce the particulars of this part of his courſe.*